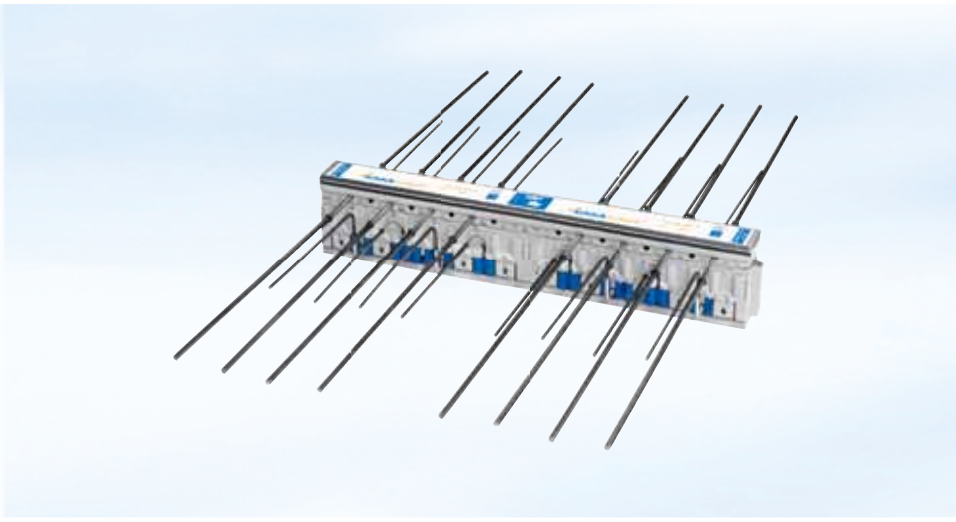
Schöck Isokorb®



Technical Manual

March, 2012

Design support department
Telephone hotline and technical project processing
Telephone: +1 519 896 2100
Fax: +1 519 896 2190
info@schoeck.ca

Seminars and on-site advice
Telephone: +1 519 896 2100
Fax: +1 519 896 2190

Schöck Isokorb®
Designing and advisory service

The Schöck Engineers in our Canadian design department will be happy answer your questions concerning structural design, construction and building physics; they will also provide structural design proposals and drawings. Please see chapter “design” for further information on available service.

To use our service, please feel free to send us your documents (plan views, sections, load information, site address):

Schoeck Canada Inc.
202-279 King Street West
Kitchener, Ontario,
N2G 1B1

- **Schoeck Design Department**
  Telephone hotline and technical project processing
  Tel: +1 519 896 2100
  Fax: +1 519 896 2190
  E-Mail: info@schoeck.ca

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  Phone: +1 519 896 2100
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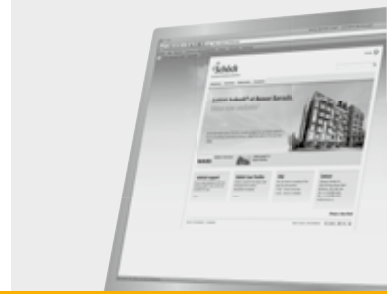


Schöck Isokorb®
Notes

The design values and recommendations provided in this technical manual represent the best of our knowledge at the time of publication. They are based on international certifications and compliance reports to Canadian Standards as well as on the results of extensive research and testing. They are intended to provide the planner and the designing engineer with a better understanding of Schöck Isokorb®. Neither Schoeck Canada Inc. nor Schöck Bauteile GmbH, the manufacturer of the Isokorb, take any responsibility for improper selection of materials, handling or installation of the Isokorb. The information contained in these technical manual are for information purposes only and may not be relied upon for any purpose. It cannot replace commonly accepted engineering rules and regulations.

Morrison Hershfield Limited provided input into the development of the Canadian version of this technical manual.

Schöck Isokorb®
Table of Contents

Schöck Isokorb®
Evaluations and Certifications

Schöck Isokorb® C-line

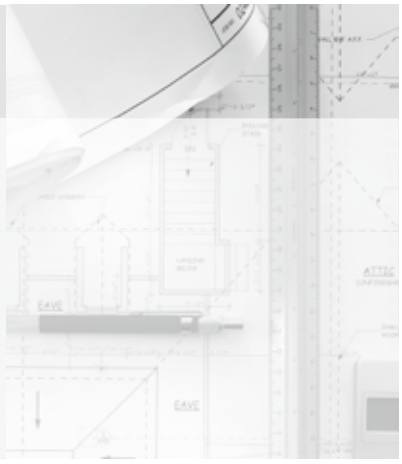
Construction with Schöck Isokorb® C-line provided in this technical manual has been evaluated in accordance with the CSA Standard A23.3.-04 Design of Concrete Structures by Morrison Hershfield Limited (Schöck Isokorb® Product Engineering Design Review for Canadian Market, evaluation report, dated March 14, 2012).

Schöck Isokorb® S-line

The design capacities of the Schöck Isokorb® type S22 have been independently checked and approved as compliant with CSA S16-09. The structural engineering firm, Fast + Epp, performed assessment calculations to CSA S16-09 of Schock Isokorb® type S22.

Certification of Schöck Isokorb®

Schöck Isokorb® has certification in different countries such as France (CSTB), Germany (DIBt) and the UK (BBA).



Schöck Isokorb® Thermal Insulation
Thermal protection

Minimizing our use of energy and natural resources are vital components of the global strategy to protect our environment and mitigate climate change. Buildings and the construction sector represent a large portion of total global energy and resource consumption. Ontario has responded to this awareness with a tightening of building energy and performance standards. For example, these new requirements are demonstrated in the Ontario Building Code (OBC) Supplementary Standard SB-10, and the new NECB. The mandated energy requirement for buildings has been reduced by about 25% from the previous standard.

In Canada about 40% of the energy consumed in buildings is space heating. Therefore, improving the building envelope using innovative construction methods and products is an efficient way to save on operational energy and improve building durability. Standard improvement strategies include reducing the window to wall ratio, using high-performance window systems and improving facade insulation by reducing thermal bridging.

Uncontrolled thermal bridging, such as balcony slabs running through the building envelope, results in high values of energy loss and the potential for premature structural damage. The impact of thermal bridging increases proportionally with the overall thermal performance of the building envelope when the sources of the bridging and the associated temperature differential are not adequately addressed.

What is a thermal bridge?

Thermal bridges are localized assemblies within the building envelope where high levels of heat loss occur and result in low internal surface temperatures, which create conditions for condensation and mold growth. Typical thermal bridging assemblies include uninsulated balcony slabs penetrating the building envelope, conductive window frames, and gaps in the continuity of insulation.
In the case of uninsulated balcony slab connections, the interaction of the geometrical thermal bridge (cooling fin effect of the balcony slab) and the material-related thermal bridge (high heat conductivity of a reinforced concrete slab) results in a great deal of heat loss, meaning that the uninsulated balcony connection is one of the most critical thermal bridges in the building envelope.

Impact of thermal bridges

In the area surrounding the thermal bridge, the additional local heat loss leads to a reduction in the internal surface temperatures. If the surface temperature drops below the dew point temperature, moisture in the air will condense on the cold surfaces. As soon as the surface temperature drops below the so-called mold temperature there is a risk of mold spores entering the room air. Mold has very serious health impacts and can trigger asthma and cause strong allergic reactions. The low surface temperatures also lead to unnecessary thermal discomfort due to radiant heat loss from the occupant's body.

Summary of the effects of thermal bridge:

- Risk of mould and dew formation
- Risk of effect on health (allergies etc.)
- Additional heating energy loss
- Discomfort

Increased risk of mold with uninsulated balconies

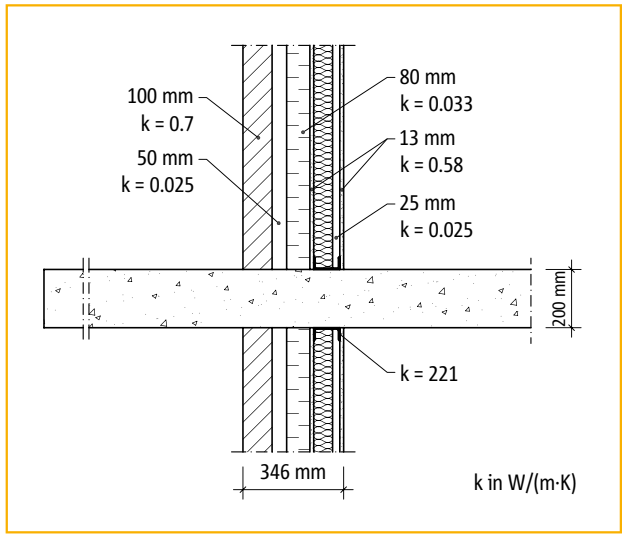
Additional heat loss with uninsulated balconies

Schöck Isokorb® Thermal Insulation
The balcony as a thermal bridge

Thermal protection with the Schöck Isokorb®

The Schöck Isokorb® makes it possible to thermally insulate the balcony detail at the insulated wall by replacing the continuous reinforced concrete with a thermally insulated connection using the Schöck Isokorb® component.

Reinforcing steel (k = 50 W/(mK)) is replaced with stainless steel (k = 15 W/(mK)), and the concrete (k = 1.6 W/(mK)) is replaced with insulating material (k = 0.031 W/(mK)). This reduces heat conductivity in the connection area by approximately 90%, and minimizes the heat loss via the balcony by about 80%. The thermal insulation provided by the Schöck Isokorb® increases the surface temperature in the living area by more than 17°C (this so called minimum surface temperature Θ is explaned on the next page), depending on the nature of the structure, see the illustration below. The risk of mold formation is also minimized, and the insulated building envelope is effectively made continuous.



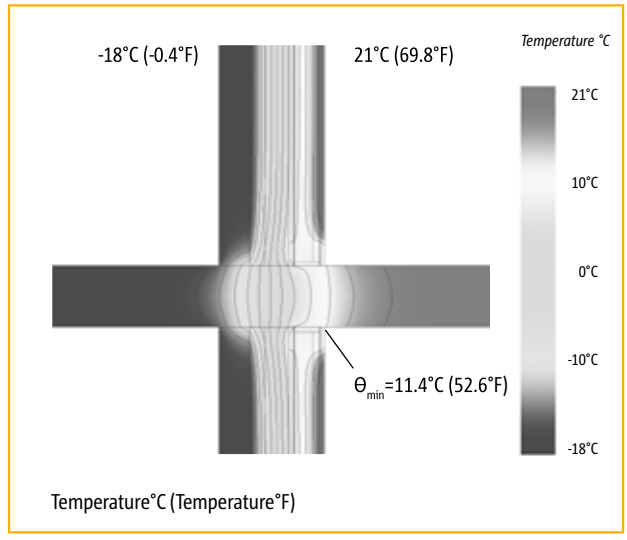
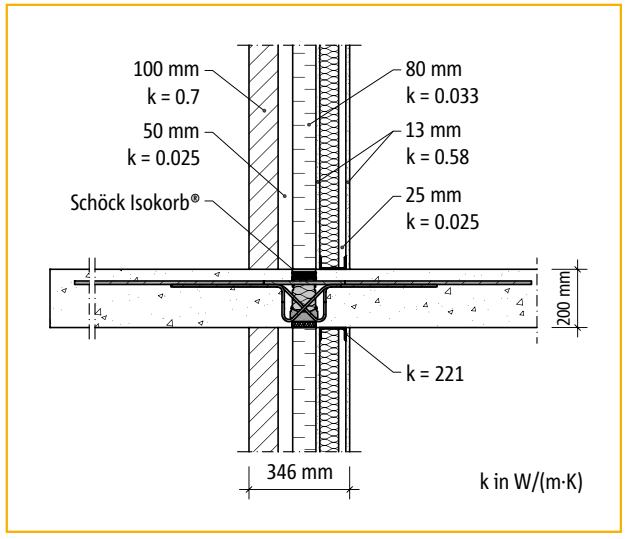


Illustration of a conventional building structure without thermal insulation of the balcony structure, with typical building component characteristics.



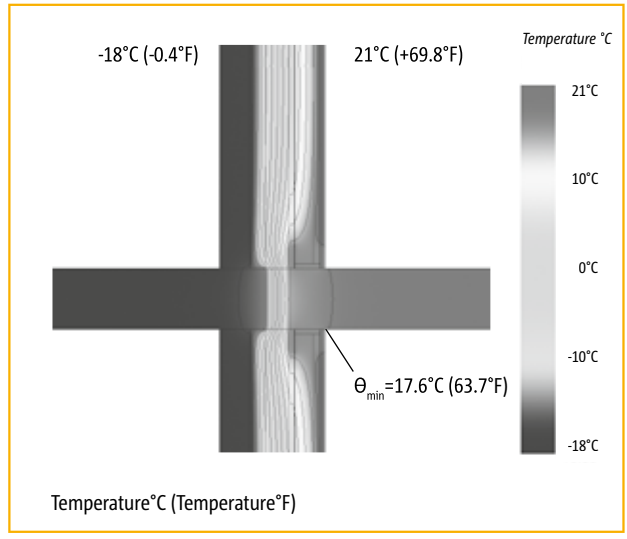


Illustration of a balcony structure with thermal insulation provided by the Schöck Isokorb, with typical building component characteristics.

The diagrams above illustrate the difference between a conventional construction method and thermal insulation using the Schöck Isokorb®. In a conventional building structure the heat can freely flow out of the interior via the balcony slab, which causes low surface temperatures θ_{min}. The Schöck Isokorb® can minimize the loss of thermal energy and thus is an effective method for reducing heat loss, and preventing damp walls and associated structural damage.

Schöck Isokorb® Thermal Insulation

Key thermal values for the products

Equivalent thermal conductivity k_{eq}

The equivalent thermal conductivity k_{eq} is the average overall thermal conductivity of the Schöck Isokorb® insulating element for the different surface proportions. If the insulating elements are of the same thickness, it is a measure of the thermal insulation effect of the connection. The smaller k_{eq} is, the greater the thermal insulation of the balcony connection. Since the equivalent thermal conductivity of the surface proportions of the materials that are used is taken into consideration, k_{eq} is dependent upon the load capacity of the Schöck Isokorb®.

Thermal transmission resistance R and R_{eq}

The R-value is a measure of heat conduction through a certain layer of a given thickness. It is dependent on the thermal conductivity k and the layer thickness of a material. With multi-layer components, the R-value for the entire component results from the sum total of all R-values. The greater the R-value, the better the thermal insulating characteristic. The equivalent thermal transmission resistance R_{eq} describes the thermal conductivity k through the Schöck Isokorb® and can be expressed as:

$$R = \frac{d}{k} = \frac{\text{Component thickness}}{\text{Thermal conductivity}}$$

$$R_{eq} = \frac{d_{Isokorb}}{k_{eq}} = \frac{\text{80 mm thickness of the Isokorb}}{\text{equivalent thermal conductivity of the Isokorb}}$$

Keep in mind, the R_{eq}-value does not include the surface conductances and the resistances for air.

The minimum surface temperature Θ_{min}

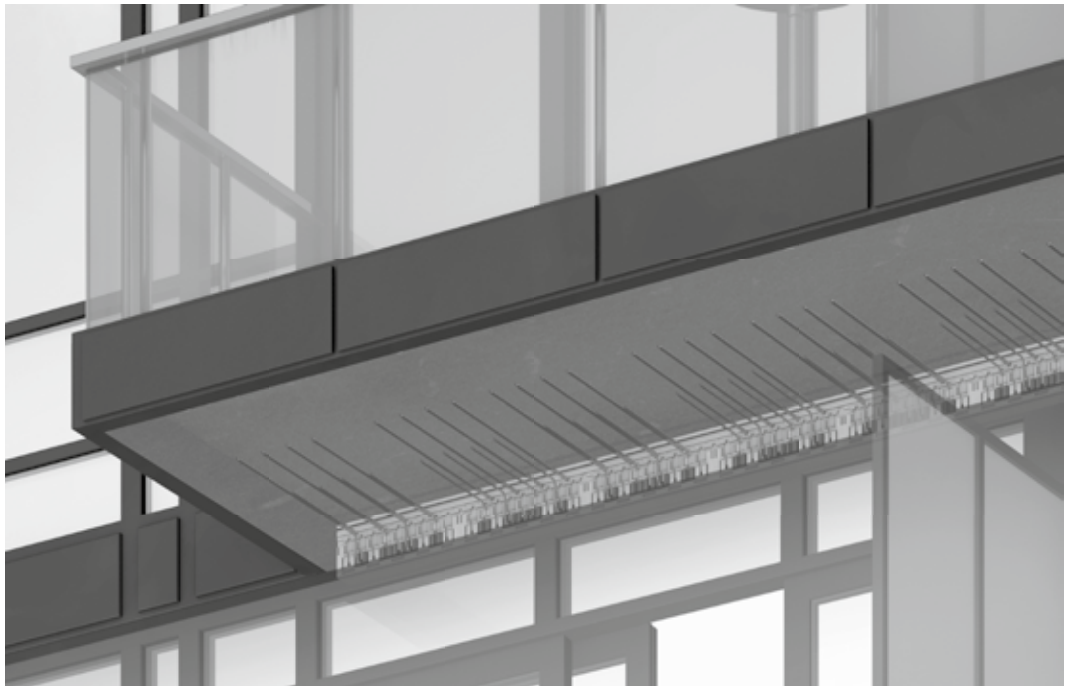
The lowest surface temperature that occurs in the vicinity of a thermal determines the potential of the formation of condensation or mold. The minimum surface temperature therefore dictates the effects of a thermal bridge with regard to moisture effects.

Key thermal values

Isokorb® type	k_{eq}-value [W/(mK)]			
	Slab thickness [mm]			
	180	200	220	250
CM10	0.16	0.15	0.13	0.12
CM20	0.18	0.17	0.16	0.14
CM30	0.21	0.19	0.18	0.16
CM40	0.25	0.23	0.21	0.19

Isokorb® type	R_{eq}-value [m²K/W]			
	Slab thickness [mm]			
	180	200	220	250
CM10	0.51	0.55	0.59	0.65
CM20	0.43	0.47	0.51	0.56
CM30	0.38	0.41	0.45	0.49
CM40	0.32	0.35	0.38	0.43

Schöck Isokorb® Product Description and Applications



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Schöck Isokorb® Product Description and Applications

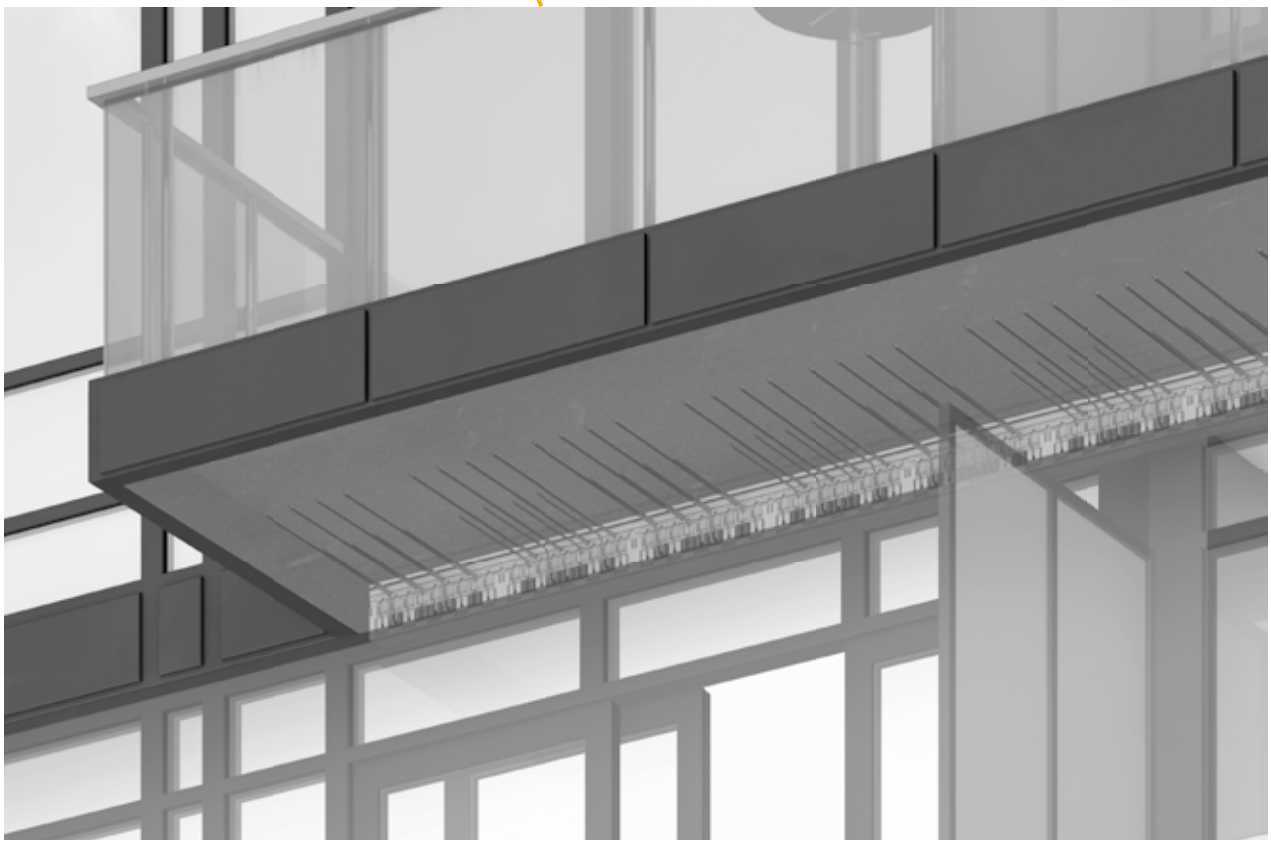
Building with Schöck Isokorb®

Typical applications for Schöck Isokorb® are cantilevered constructions such as balconies in high-rise residentials or canopies in institutional buildings. Solutions are available for concrete and steel structures.

Placement details for Schöck Isokorb®

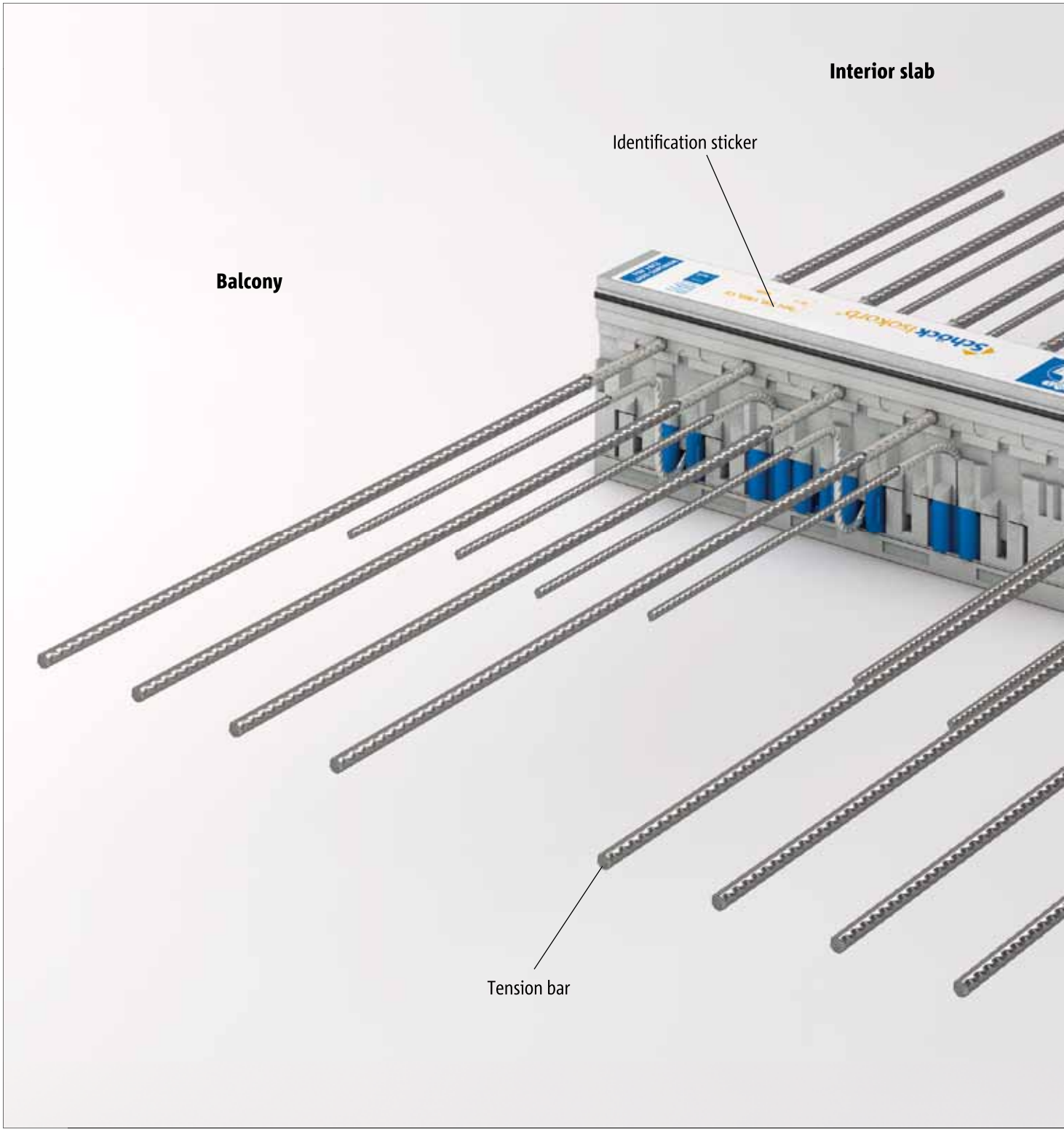
The sample details illustrate the incorporation of Isokorb® at a typical balcony with brick cladding at the back wall and window wall. The Schöck Isokorb® is located outboard of the backup wall to avoid structural interference with the attachment of steel stud tracks or window wall deflection header. Special consideration has also been paid to allow for a practical construction detail at the Isokorb® / concrete slab interface while maintaining waterproofing continuity and serviceability by illustrating removable flashings.

The details with incorporated Schöck Isokorb® have to be approved by the engineer of record (EOR) for the slab design and the selection of the appropriate Isokorb® product.

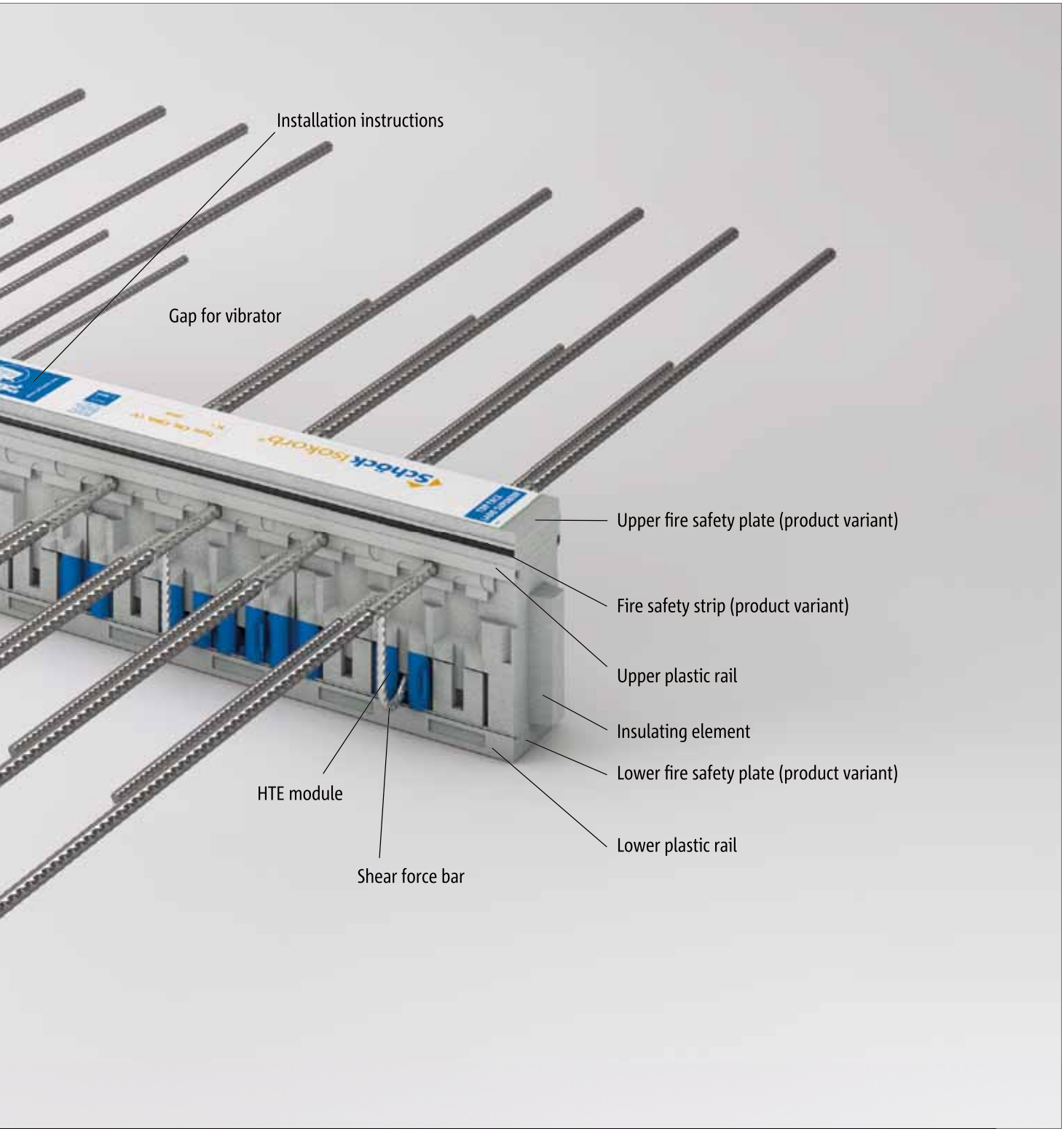


Schöck Isokorb® Product Description and Applications

Design and materials for Schöck Isokorb®



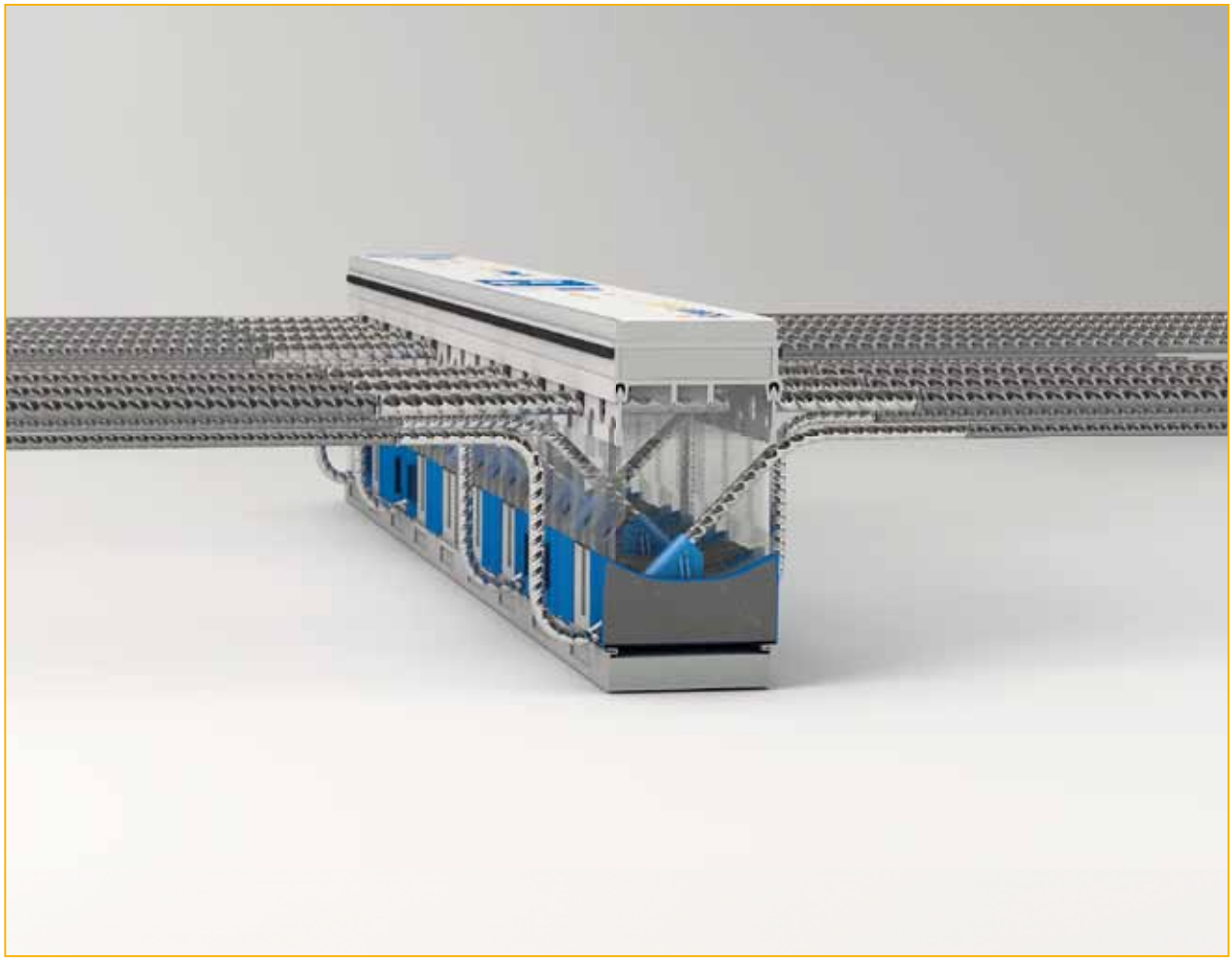
Schöck Isokorb® type CM: Component designations



The Schöck Isokorb® is a load-bearing thermal break element and mainly works as follows:
1. The insulating element thermally separates the balcony slab from the interior slab and therefore reduces the thermal bridge.
2. The Schöck Isokorb® transfers the loads from the balcony slab into the interior slab.

Schöck Isokorb® Product Description and Applications

Design and materials for Schöck Isokorb®



Schöck Isokorb® type CM: Internal view

In order to transfer the load from the balcony slab into the interior slab, the load bearing components penetrate the insulating element. The load bearing components are tension bars, shear force bars and HTE modules. Consisting of micro-steel fibre reinforced high-performance concrete, enclosed in plastic casing, the HTE modules are embedded in the insulating element. They act as a pressure bearing, and transfer the pressure force from the balcony into the interior slab.

Tension bars have a diameter of 12 mm and are held in position by the upper plastic rail. Shear force bars have a diameter of 8 mm.

The Schöck Isokorb® is available with different load bearing capacities, depending on the real loads. Load bearing capacities differ in their number of tension bars, shear force bars and HTE modules. The Schöck Isokorb® type CM is available in different heights, ranging from 180 mm to 250 mm.

HTE pressure bearing with shear force bar

The identification sticker on the top of the Schöck Isokorb® contains information about the type, the load capacity, the height, the manufacturer, and the installation leaflets, which are supplementary to the detailed installation instructions that are provided with the delivery.

Schöck Isokorb® Product Description and Applications
Materials for Schöck Isokorb® / Fire protection

Materials for Schöck Isokorb®

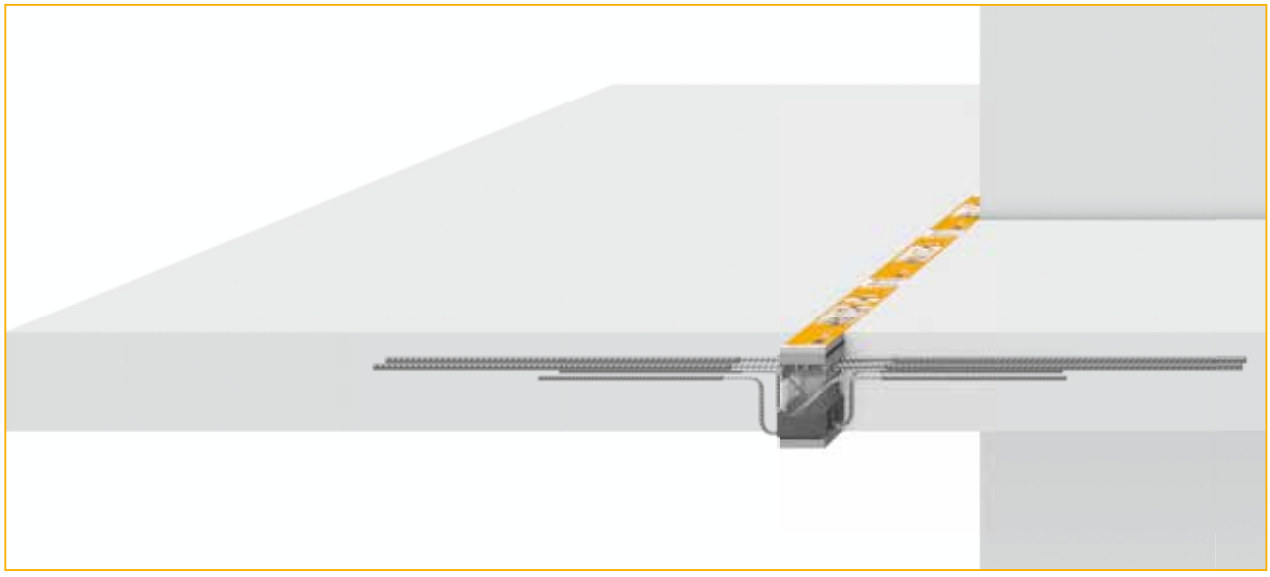
Materials for Schöck Isokorb®	Material	Conforming to	equivalent to
Tension bar	High-yield ribbed reinforcement bar BSt 500 B Stainless steel ribbed reinforcement BSt 500 A NR material no. 1.4362, minimum nominal yield strength 700MPa	German Standard DIN 488-1 German Standard DIN 488-1	CAN/CSA G30.18-M92 (R2002) ASTM A955M-96
Shear force bar	High-yield ribbed reinforcement bar BSt 500 B Stainless steel ribbed reinforcement BSt 500 A NR material no. 1.4362, minimum nominal yield strength 700MPa	German Standard DIN 488-1 German Standard DIN 488-1	CAN/CSA G30.18-M92 (R2002) ASTM A955M-96
HTE pressure bearing	High-strength, fibre reinforced concrete Plastic sleeve of HD-PE plastic		
Insulation material	Polystyrene hard foam, k = 0.035 W/(mK)		
Fire protection boards	Lightweight building boards, material class A1 Cement bound fire safety boards, mineral wool ρ ≥150 kg/m³ Melting point T≥ 1000 °C	made from fibre-glass cement bonded board complying with DIN 4102-2 : 1977	
Fire safety strips	made from Roku-strip		

Schöck Isokorb® fire protection

Schöck Isokorb® is available with or without fire protection. If fire safety requirements apply, CM and CV types (with HTE modules) are available in a R120 version (120 minutes fire resistance), and types CMD, CVB and CEQ (without HTE modules) in a R90 version (90 minutes fire resistance). Integrated fire safety strips (type CM), made of intumescent material, and fire protection plates close the gaps opening under exposure to fire, ensuring that the Isokorb® reinforcement is protected from hot gas (see illustration); the fire protection plates protrude by 10 mm on the top of the Schöck Isokorb® types CMD, CV, CVB and CEQ. R90 resp. R120 classifications are achieved with these versions, even without additional on-site fire safety measures (e.g. mineral coating). The picture shows Schöck Isokorb® type CM in R120.

Schöck Isokorb® Product Description and Applications

Concrete slab construction with the Schöck Isokorb®



Schöck Isokorb® type CM: Balcony connection indirectly supported

Balconies and other external structural components should be designed by the Engineer of Record (EOR) in agreement with CSA A23.3-04.

A balcony structure with Schöck Isokorb® can be supported either directly or indirectly. Direct support means that the balcony slab is connected to the interior slab, and this is supported on a wall or an interior slab joist. With indirect support the balcony slab with Schöck Isokorb® is only connected to the interior slab. Indirect support is shown here.

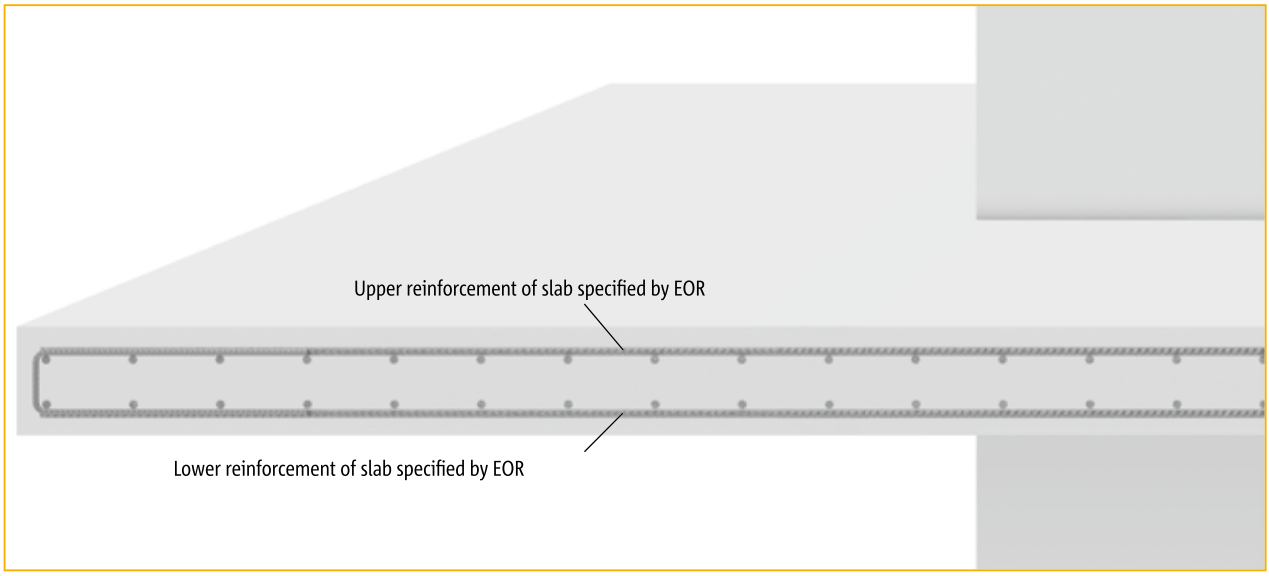
The following materials are assumed for the connecting components:

Materials for connecting components

Materials and construction materials Connecting components	Material	Building regulations
Cast-in-place reinforcement, interior slab	Uncoated deformed reinforcing steel Grade 400R (CSA Standard G30.18-M92 (R2002))	CSA Standard G30.18-M92 (R2002)
Cast-in-place reinforcement, balcony	Uncoated deformed reinforcing steel Grade 400R (CSA Standard G30.18-M92 (R2002))	CSA Standard G30.18-M92 (R2002)
Concrete quality, interior components	Minimum concrete quality 25 MPa for interior components	CSA Standard A23.1-04
Concrete quality, exterior components	Minimum concrete quality 30 MPa for exterior components and class F-1 concrete	CSA Standard A23.1-04

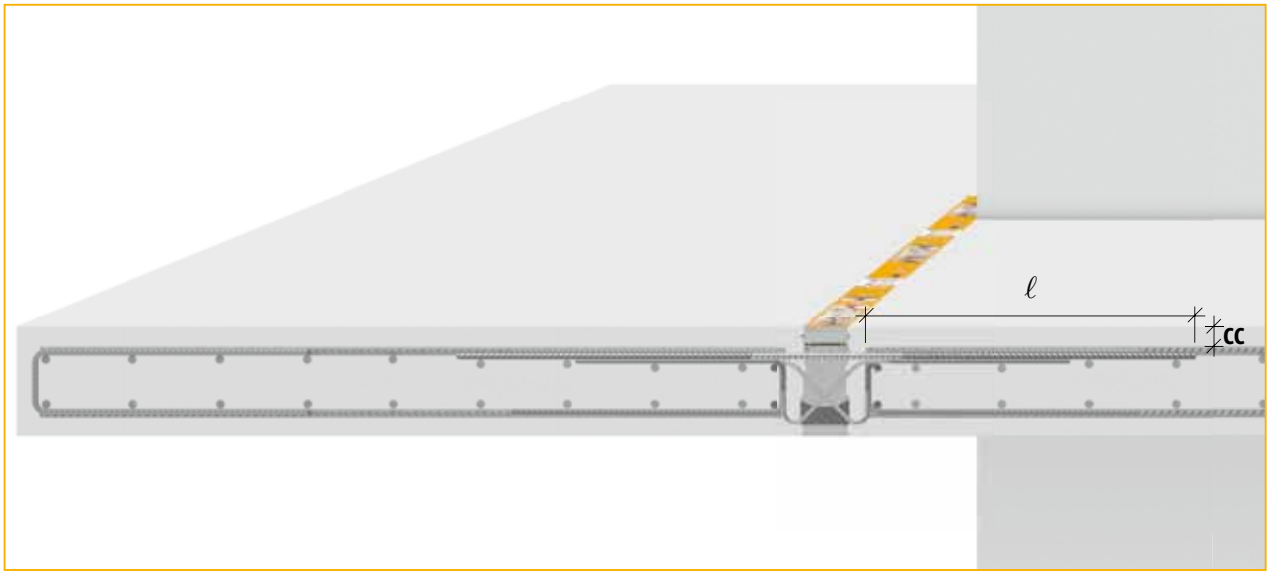
Schöck Isokorb® Product Description and Applications
Cast-in-place reinforcement

Reinforcement for interior slab and balcony slab to be designed by the EOR of the base building.



Reinforcement of a traditional balcony slab

Reinforced concrete cantilever balconies require upper and lower reinforcement and reinforcement surrounding the free borders. When using the Schöck Isokorb® the following cast-in-place reinforcement is required.

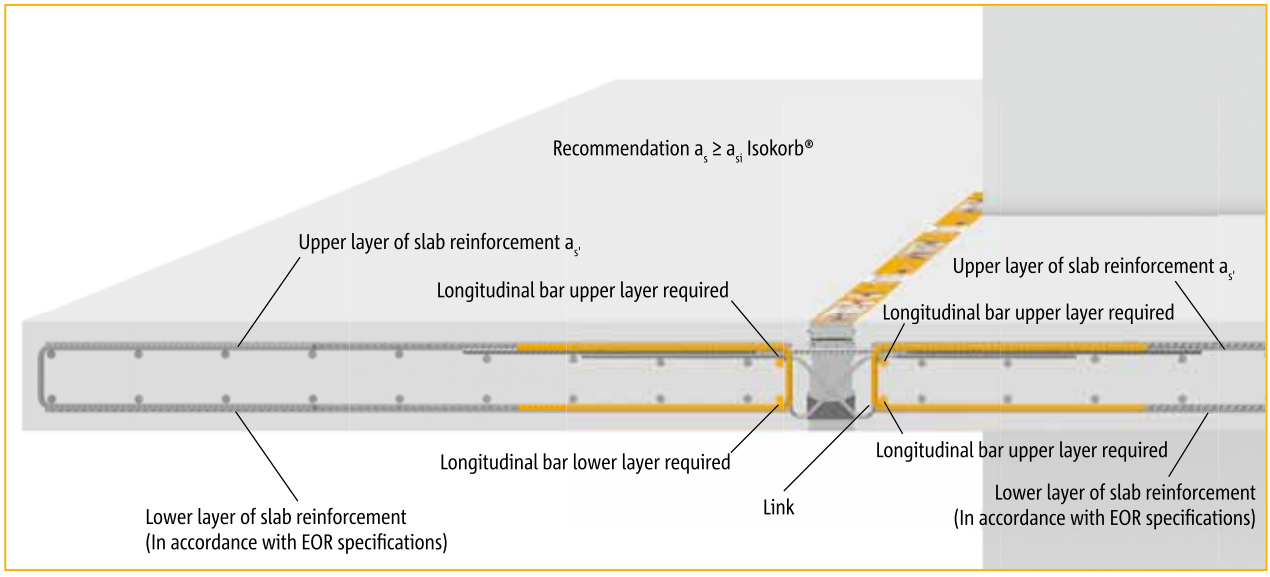


Schöck Isokorb® type CM: Overlap length l_s, concrete cover CC

The bar lengths are designed to meet the lap splice length requirements of CSA A23.3 Cl 11.4.3.2.
The standard minimum concrete cover (CC) is defined by the Schöck Isokorb® as 40 mm (alternatively 55 mm).

Schöck Isokorb® Product Description and Applications

Schöck Isokorb® Cast-in-place reinforcement



Schöck Isokorb® type CM: cast-in-place reinforcement with indirect support

Please note the following for the placement of slab reinforcement with Schöck Isokorb®:

The lap splice of the Schöck Isokorb® tension and shear force bars must be provided both at the interior and the balcony side. The required lap splice reinforcement (a_s) must be at least equal to the Schöck Isokorb® reinforcement (req. $a_s \geq$ exist. a_{si}).

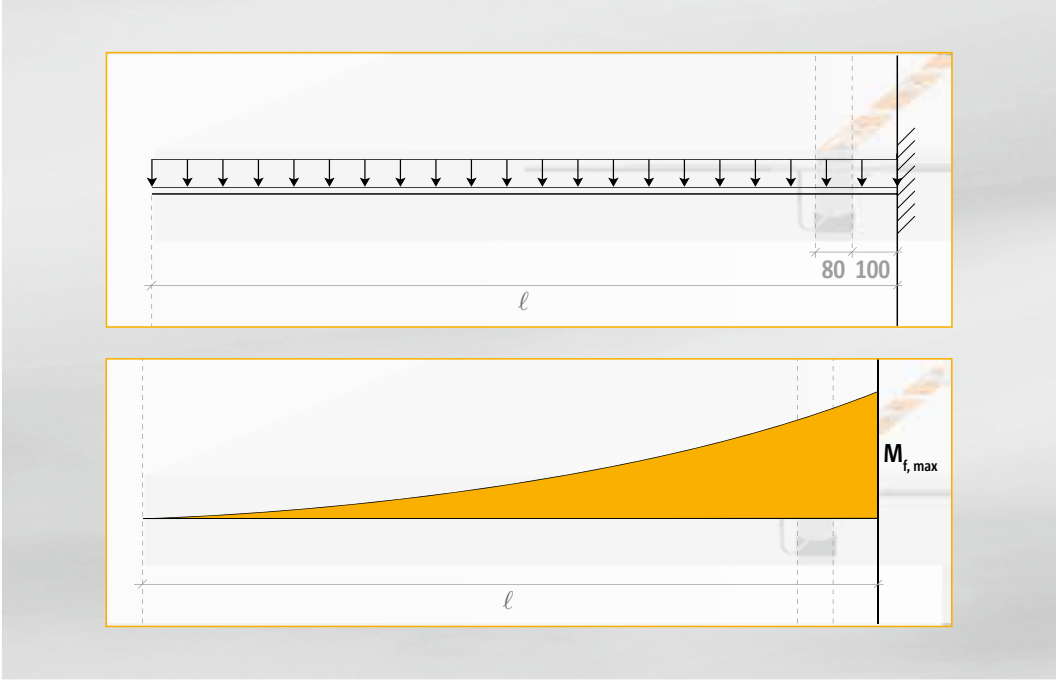
Two longitudinal bars (minimum 10M) are required parallel to the in insulating element at the balcony side, one bar being arranged in the upper reinforcement layer, the other in the lower.

Two longitudinal bars (minimum 10M, parallel to the insulating element) and U-bars (surrounding the free borders) are required at the interior slab.

The final reinforcement design and arrangement depends on the Isokorb® types. Please see the Isokorb® product chapters for further details.

The existing slab reinforcement can be taken into account for the required reinforcement of connections with Schöck Isokorb®.

Schöck Isokorb® Load-bearing Behavior



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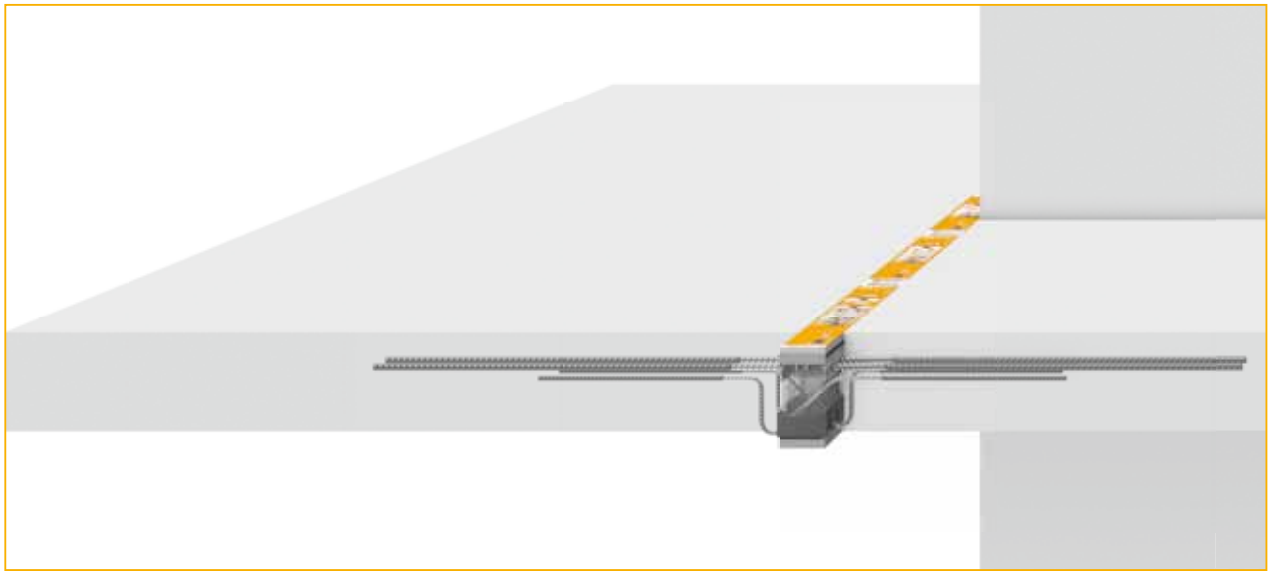
Schöck Isokorb® Load-bearing Behavior

Load resistance and load transmission

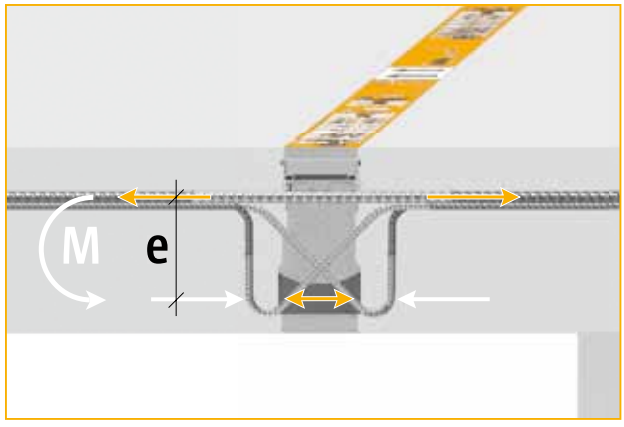


Schöck Isokorb® type CM: Balcony connection indirectly supported

Moment transfer

Isokorbs for cantilever balconies must be able to transfer moments and shear forces into the interior slab. The bending moment is transferred through the tension bars (top side) and the pressure bearings (bottom side), split into a pair of forces (tension and compression force). The moment results from the force F multiplied by the inner lever arm e.
M = F × e

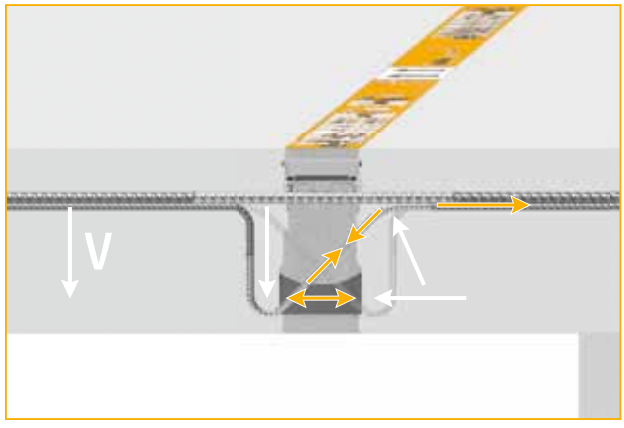
The higher the Isokorb® (and the bigger the lever arm), the higher is the moment capacity. The maximum moment that can be transferred is termed as M_r, as per CSA A23.3-04.



Schöck Isokorb® type CM: simplified diagram of moment load resistance

Vertical Shear transfer

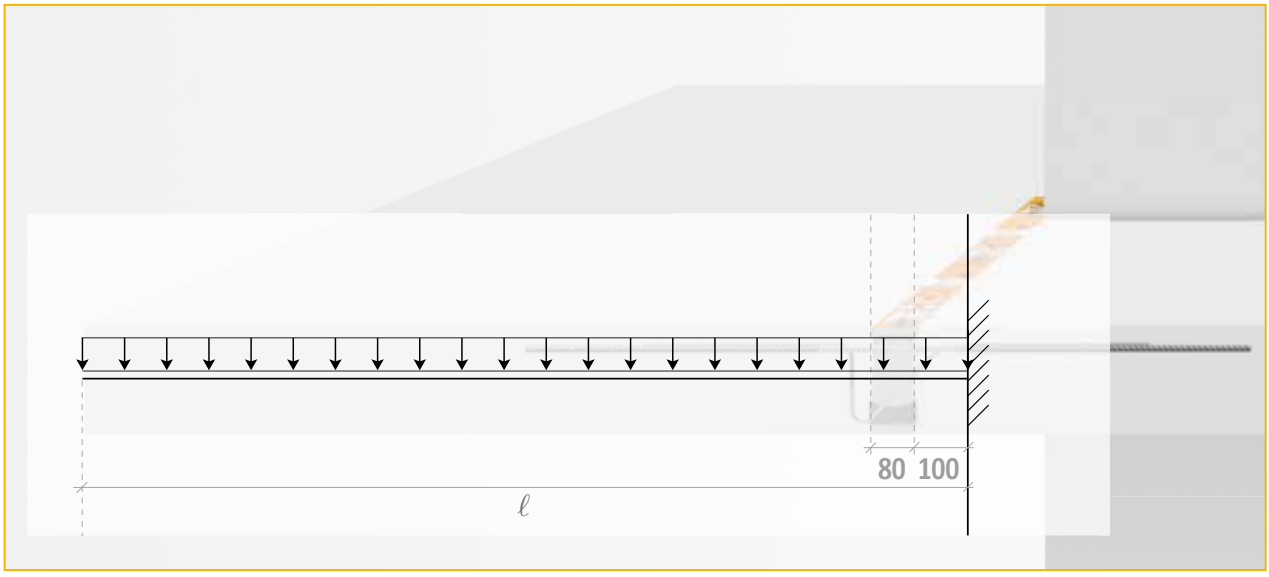
The vertical shear force is transferred into the bent corner of the tension bar. There it is split into a tension and a compression component, the tension component being transferred by the shear force bar and the compression component by the pressure bearing. The maximum possible shear force that can be transferred is termed as V_r, as per CSA A23.3-04.



Schöck Isokorb® type CM: simplified diagram of shear force load resistance

Schöck Isokorb® Load-bearing Behavior

Load resistance and load transmission

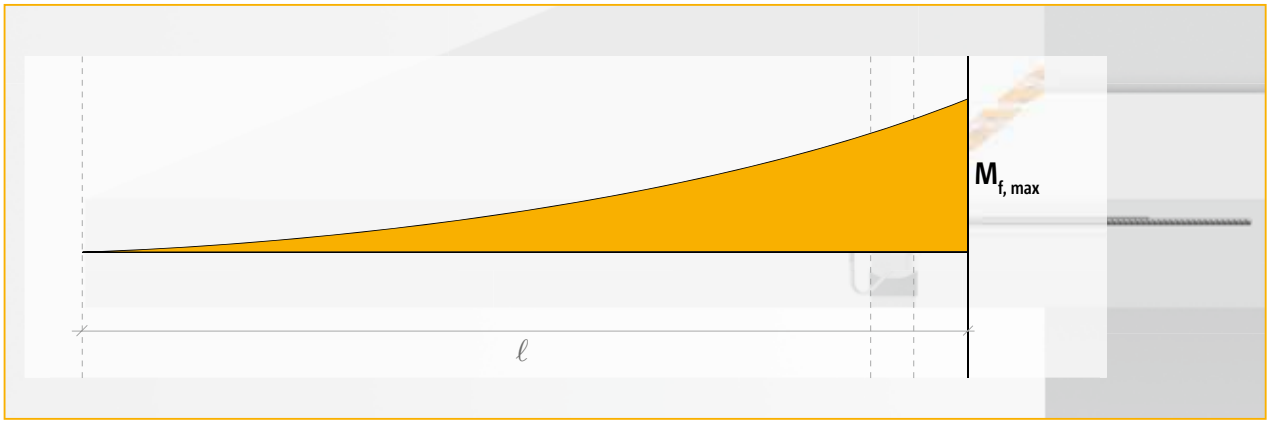


Schöck Isokorb® type CM: Load distribution

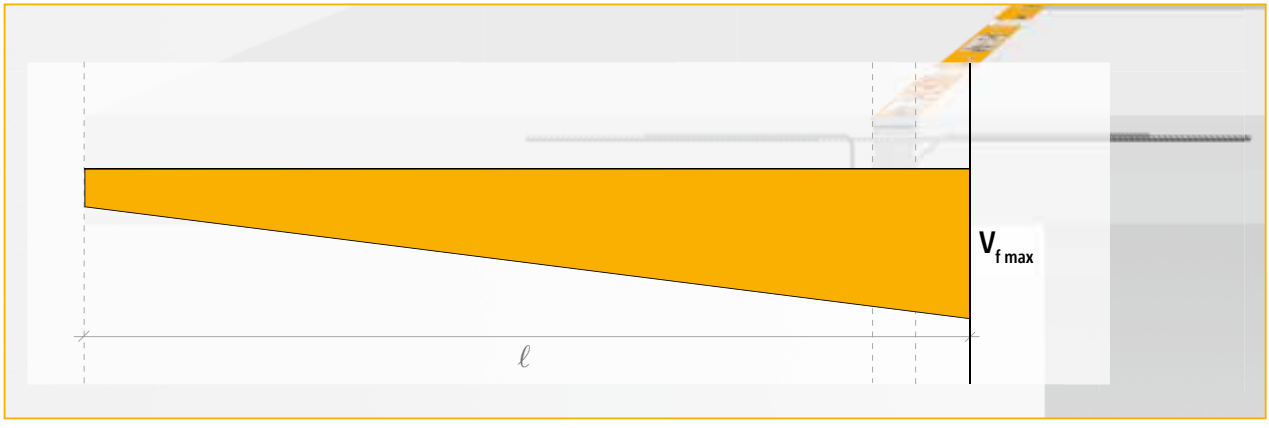
Load distribution

The load distribution for a balcony with a Schöck Isokorb® is determined in accordance with the National Building Code of Canada. The illustration shows an example load case for dimensioning the Schöck Isokorb®.

Dead (DL) and Live (LL) loads are computed.



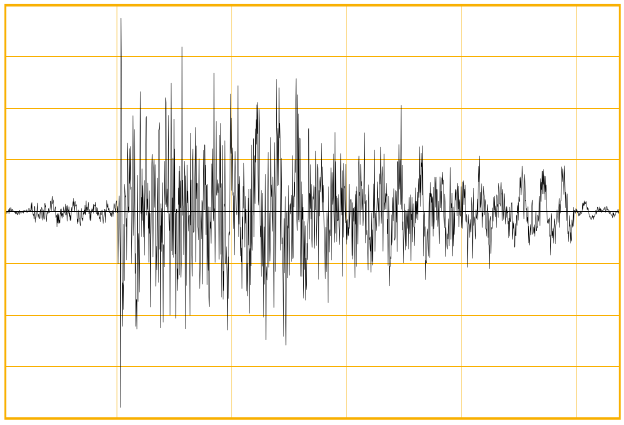
Schöck Isokorb® type CM: Moment diagram



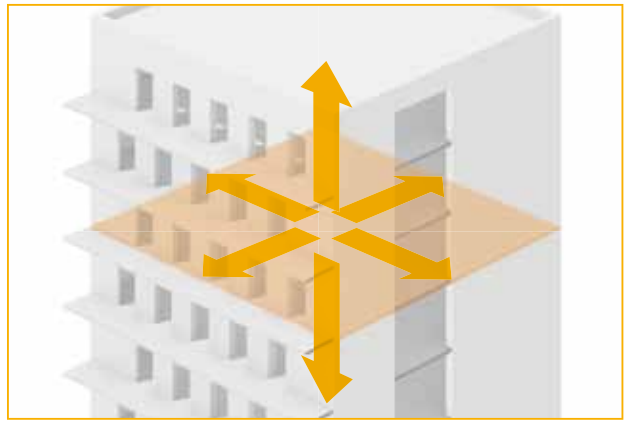
Schöck Isokorb® type CM: Shear force diagram

Schöck Isokorb® Load-bearing Behavior

Load-bearing behavior in earthquake load case



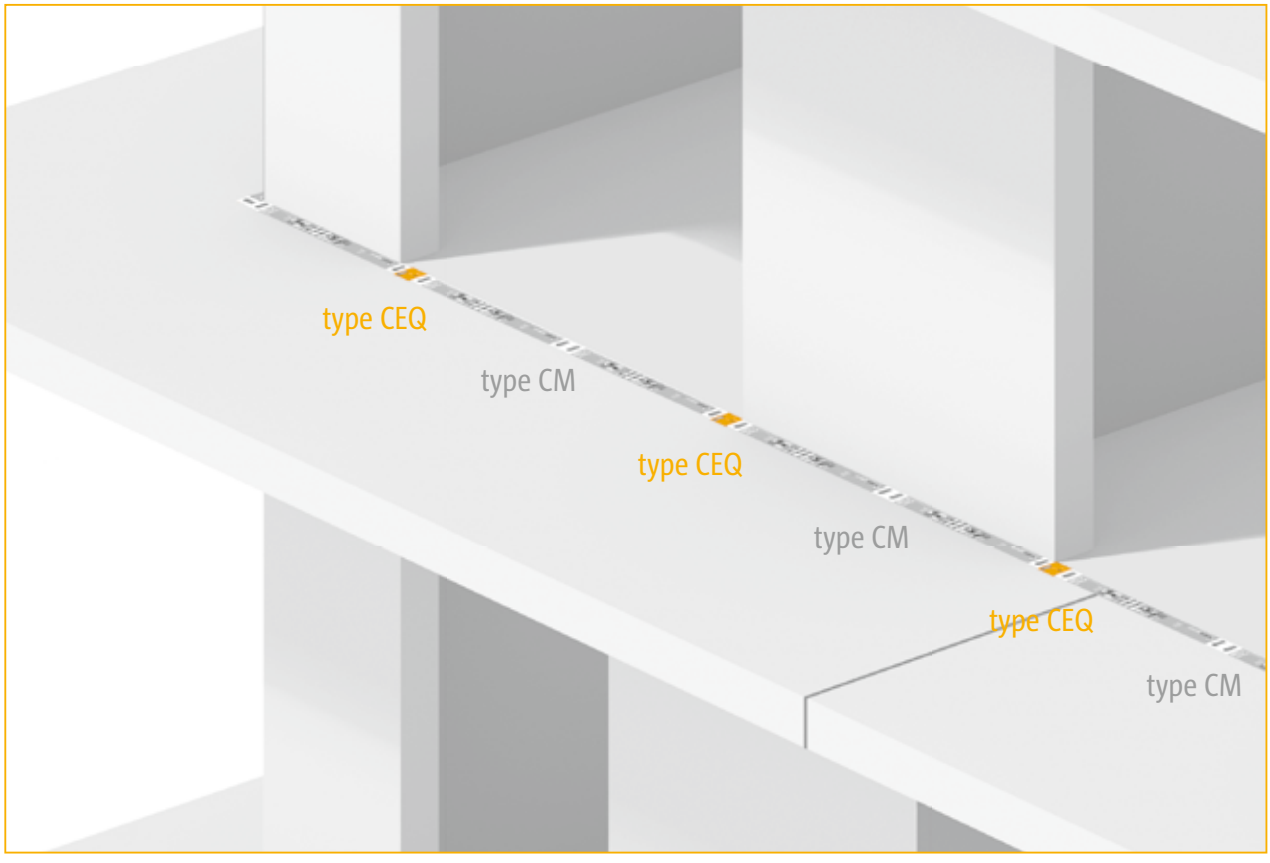
Earthquake vibration



Movement directions of a building during an earthquake

Buildings in seismic zones (earthquake zones) have to resist additional loads from the earthquake. The balcony is considered to be an external component. Country-specific regulations apply to this. The earthquake load is a rare load, in which case safety reserves may be activated in the Schöck Isokorb®. The behavior of the Schöck Isokorb® type CEQ is explained in the following, which absorbs the loads from earthquakes in interaction with the Schöck Isokorb® type CM. The loads can also be absorbed in interaction with type CV and CMD, for further information please contact the Schöck Design department..

The required number of Schöck Isokorb® types CEQ is determined in accordance with the earthquake load analysis. Earthquake loads typically result in the following movements: horizontal in the direction of both building axes, upwards and downwards. The balconies follow these movements after a delay. Resulting loads are explained below.



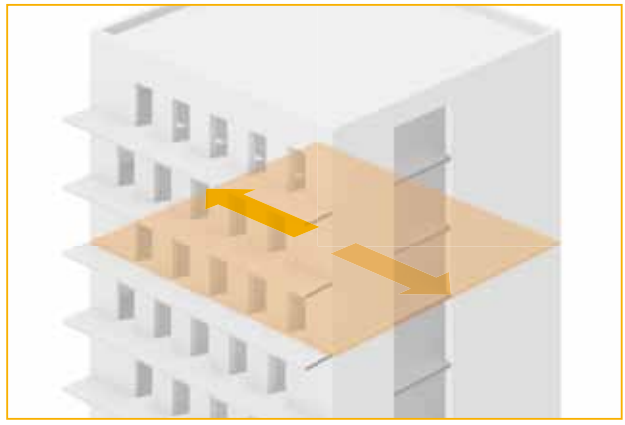
Resisting earthquake loads: Schöck Isokorb® type CEQ in combination with Schöck Isokorb® type CM

Schöck Isokorb® Load-bearing Behavior

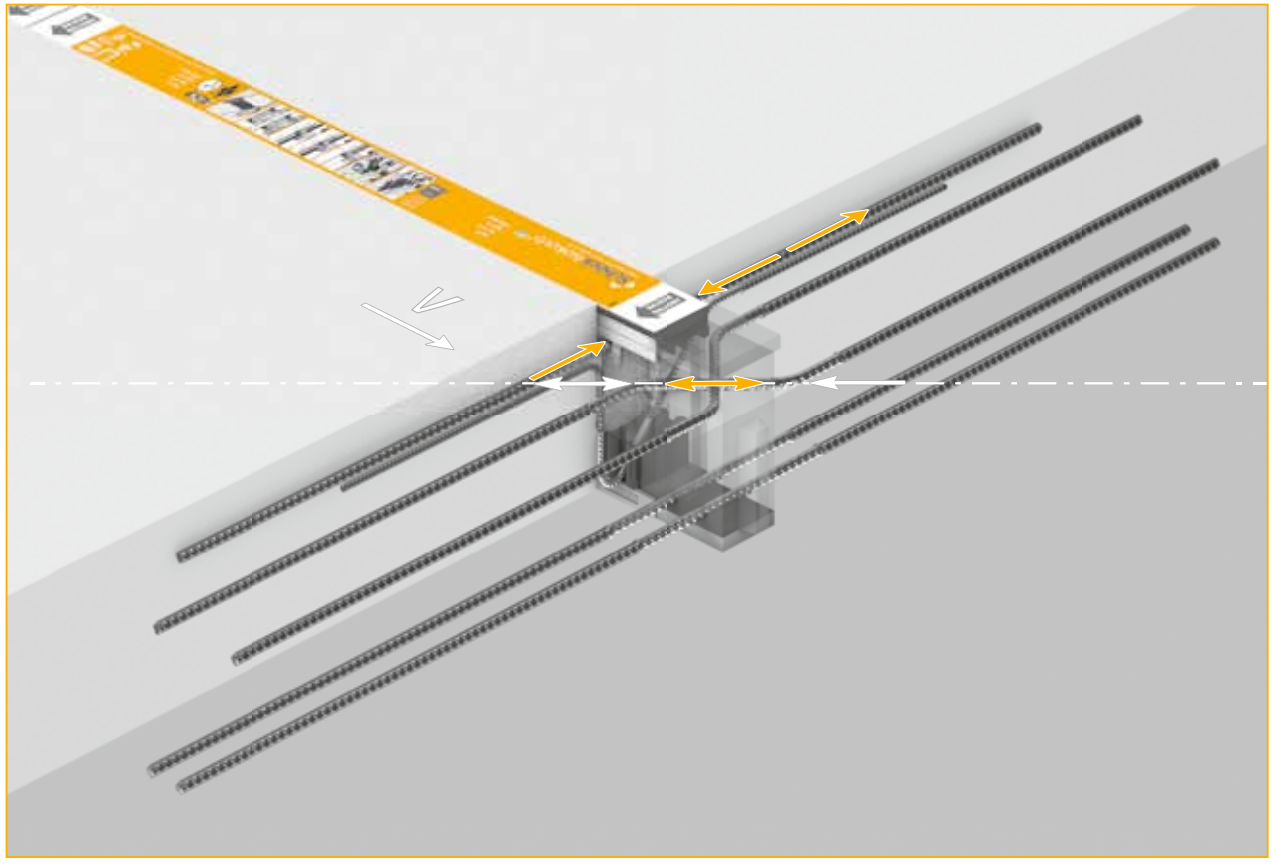
Load-bearing behavior in earthquake load case

Building movement direction parallel to the insulating joint: Horizontal shear force load.

The horizontal parts of the shear force are resisted by the horizontal shear force bars of the Schöck Isokorb® type CEQ and the tension bar of the Schöck Isokorb® type CM.



Movement direction parallel to insulating joint.



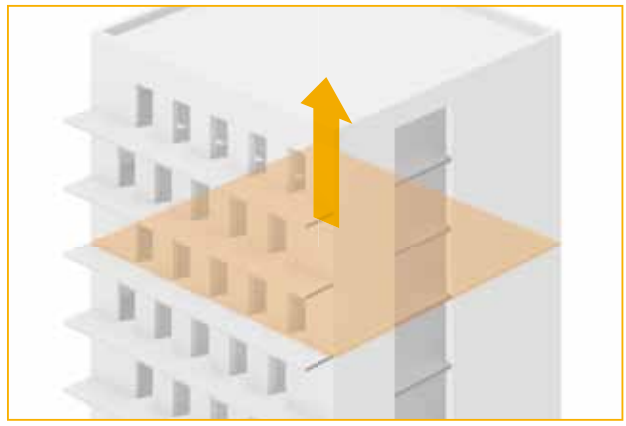
Schöck Isokorb®: simplified diagram of load resistance of a horizontal shear force

Schöck Isokorb® Load-bearing Behavior

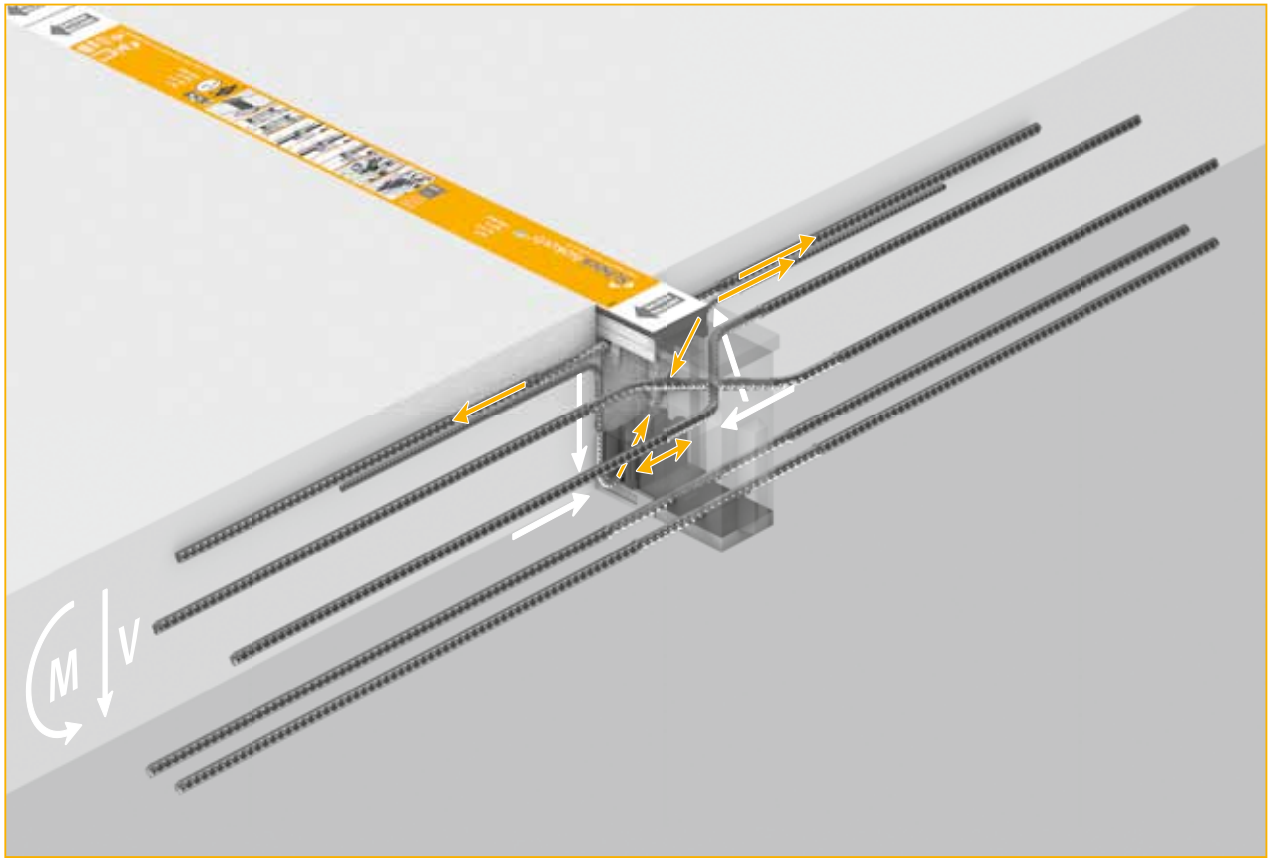
Load-bearing behavior in earthquake load case

Building movement direction upwards:
Negative moment load, positive shear force load

This means that moment acts like a normal load, as does the shear force. The load is dissipated by the Schöck Isokorb® type CM, as described in the previous chapter.



Building movement direction upwards



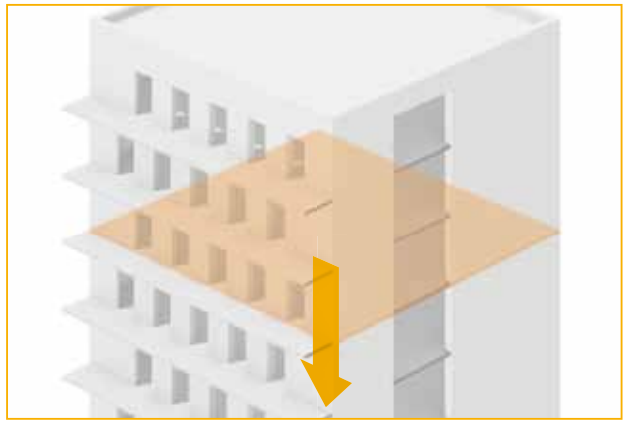
Schöck Isokorb®: simplified diagram of load resistance of a negative moment and a positive shear force

Schöck Isokorb® Load-bearing Behavior

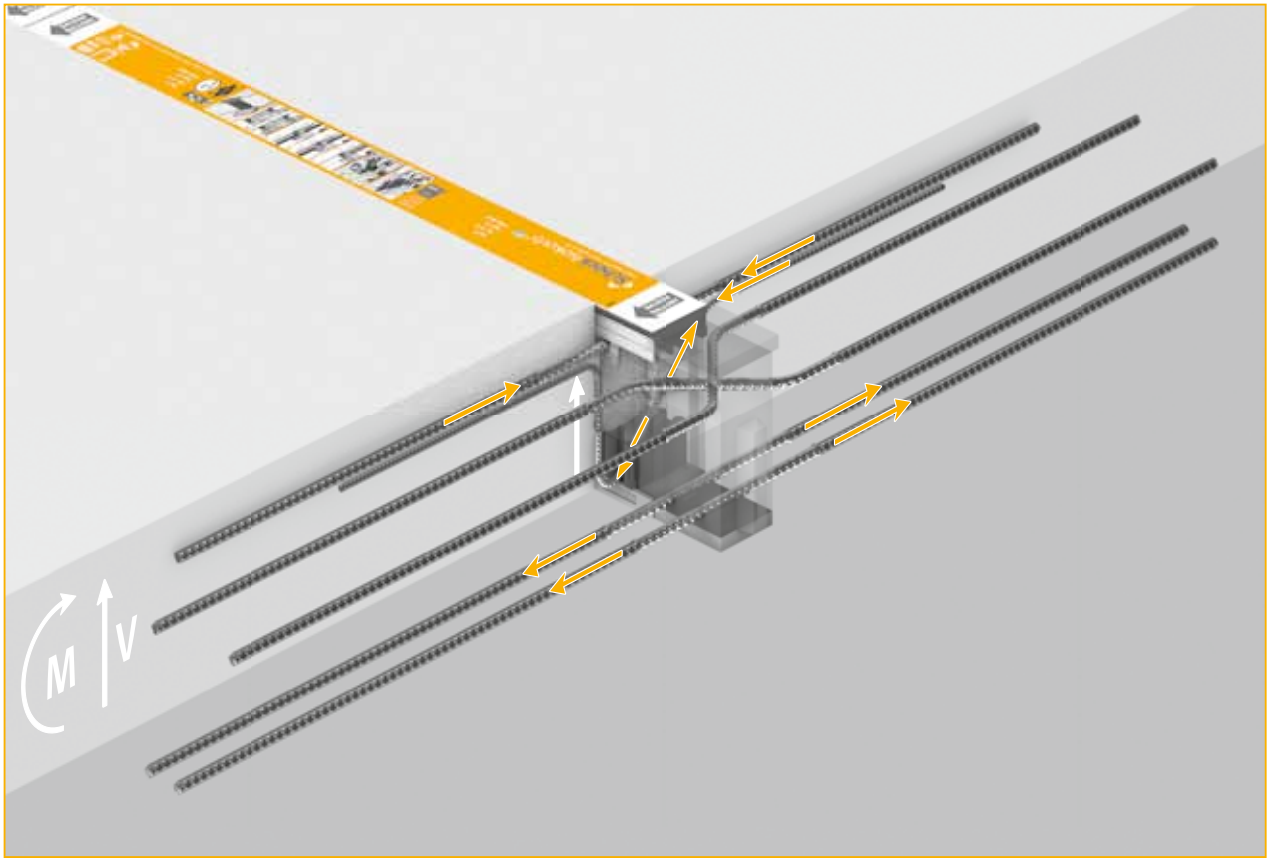
Load-bearing behavior in earthquake load case

Building movement direction downwards:
Positive moment load, negative shear force load

This means that the moment acts against the normal loading of the Schöck Isokorb®. This load is absorbed by the combination of the Schöck Isokorb® type CM and the Schöck Isokorb® type CEQ. The Schöck Isokorb® type CEQ resists the bottom tensile force.



Building movement direction downwards



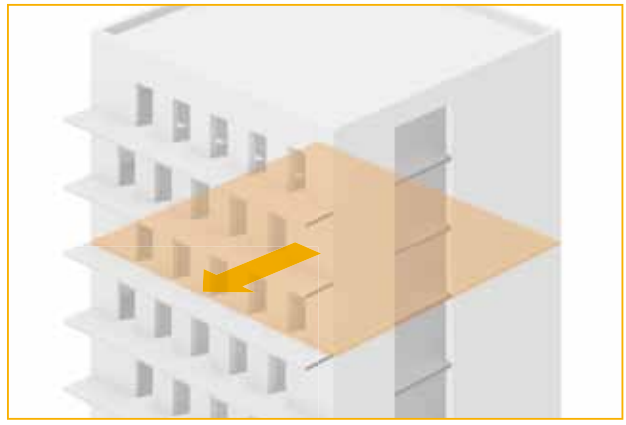
Schöck Isokorb®: simplified diagram of load resistance of a positive moment and a negative shear force

Schöck Isokorb® Load-bearing Behavior

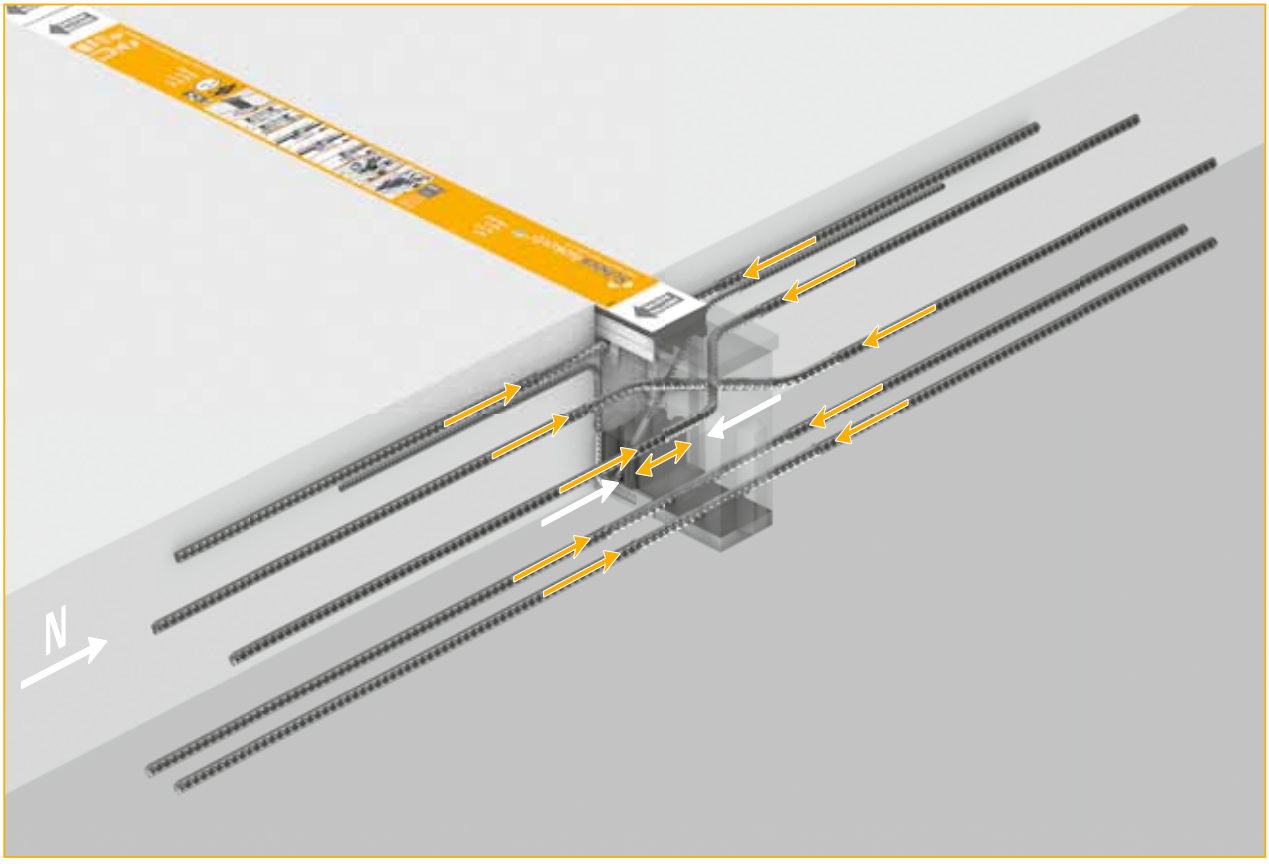
Load-bearing behavior in earthquake load case

Building movement perpendicular to the insulating joint towards the balcony: Horizontal compression load.

The horizontal compression force is resisted by interaction of the tension bars and pressure bearings of the Schöck Isokorb® type CM and the Schöck Isokorb® type CEQ. The tension bars are relieved when this occurs.



Movement direction perpendicular to insulating joint. Compression load



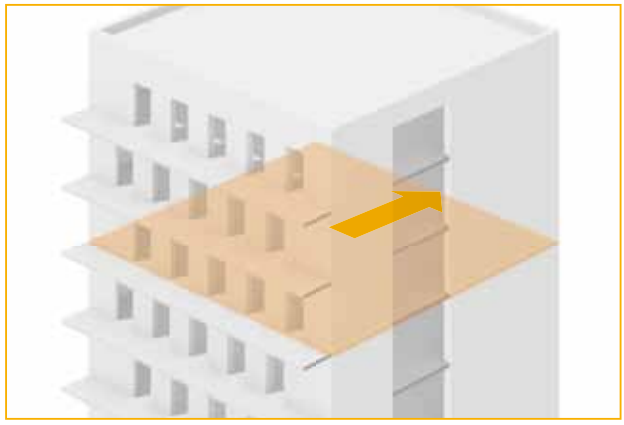
Schöck Isokorb®: simplified diagram of load resistance of horizontal compression force perpendicular to the insulating joint

Schöck Isokorb® Load-bearing Behavior

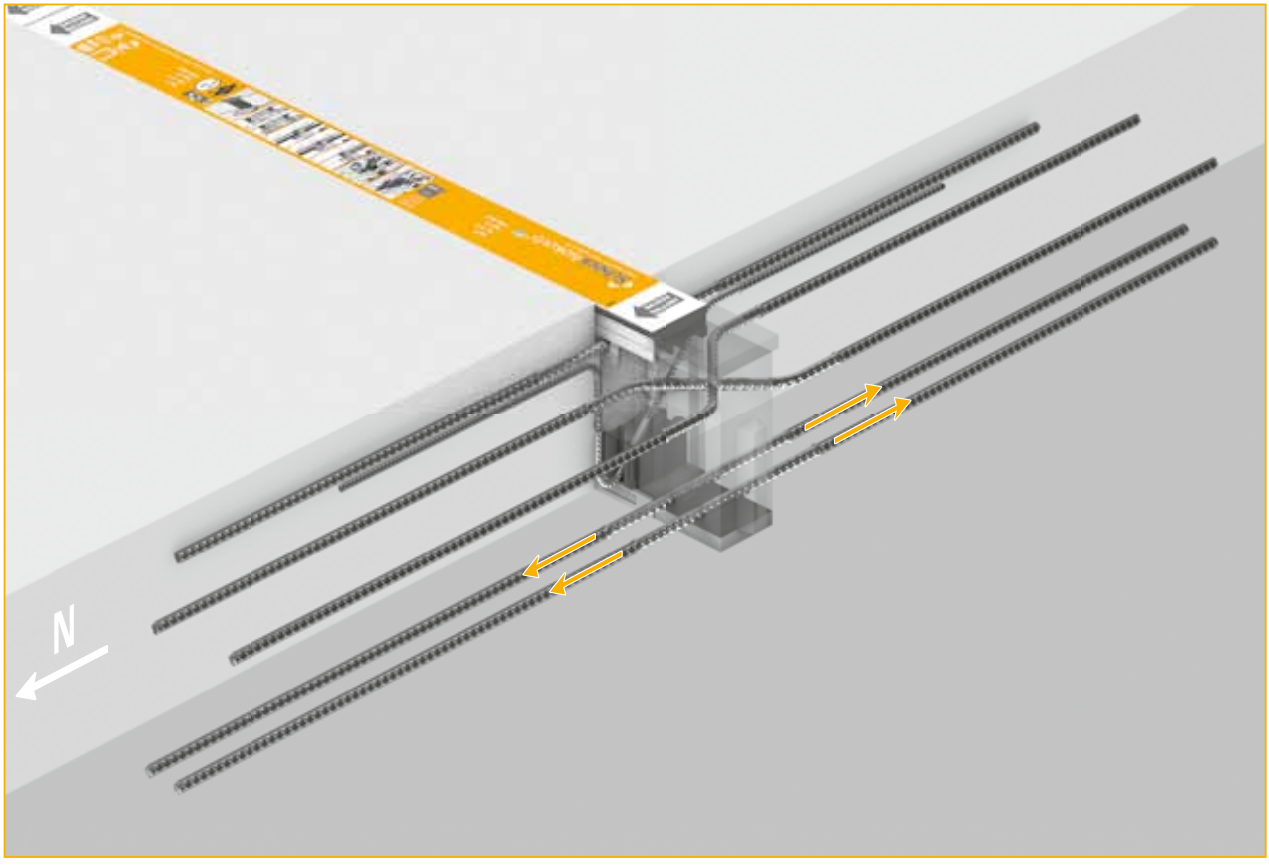
Load-bearing behavior in earthquake load case

Building movement perpendicular to the insulating joint away from the balcony: Horizontal tension load.

The horizontal tensile force is dissipated by the tension bars of the Schöck Isokorb® type CEQ.



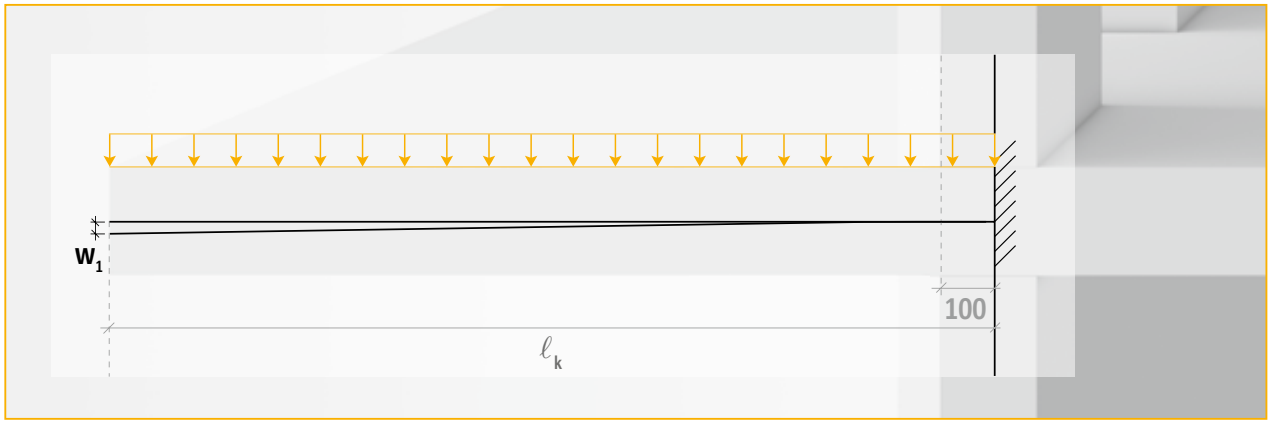
Movement direction perpendicular to insulating joint. Tension load



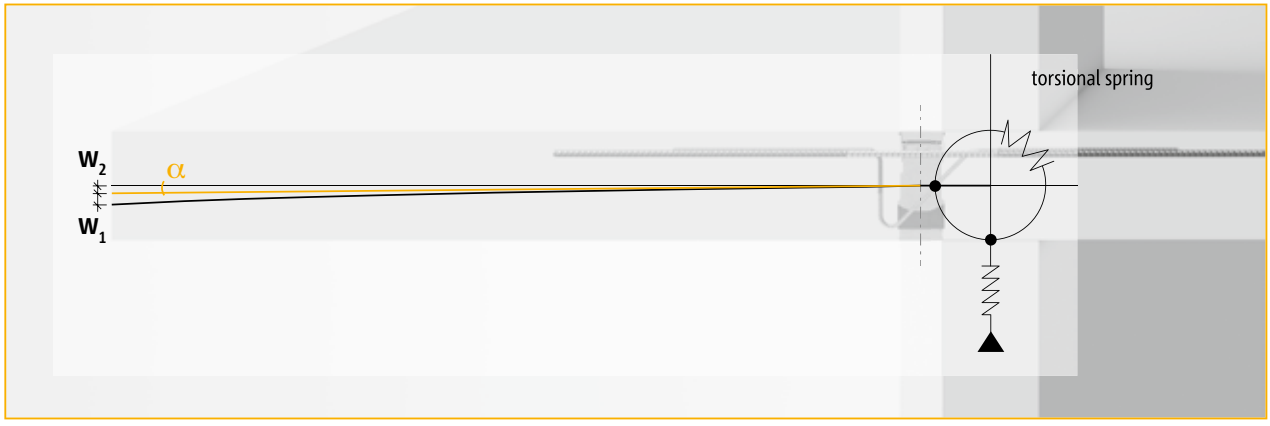
Schöck Isokorb®: simplified diagram of load resistance of horizontal tension force perpendicular to the insulating joint

Schöck Isokorb® Load-bearing Behavior

Deflection behavior



Deformation of a balcony slab without Schöck Isokorb®



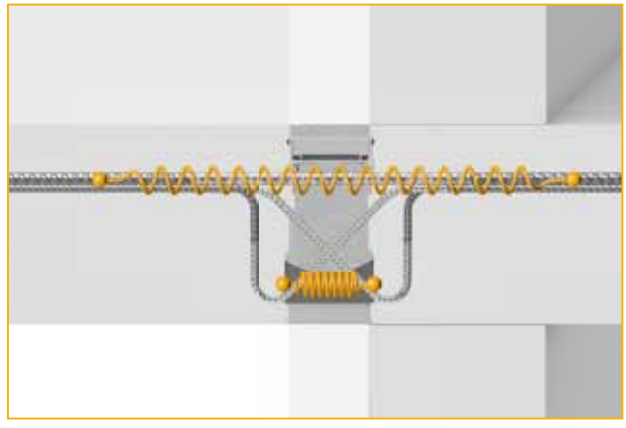
Deformation of a balcony slab with Schöck Isokorb®

Deflection

Balcony deformation is a result of loading, twisting of the interior slab and deformation of the balcony. Generally, the deformation is measured at the tip of the cantilever.

The Schöck Isokorb® is simulated by two springs, the top spring simulating the tension bar, the bottom spring simulating the HTE pressure bearing. When exposed to a bending moment, the bottom spring is compressed, and the top spring is expanded. This produces a twist angle α in the Schöck Isokorb®, statically simulated by a torsion spring as illustrated.

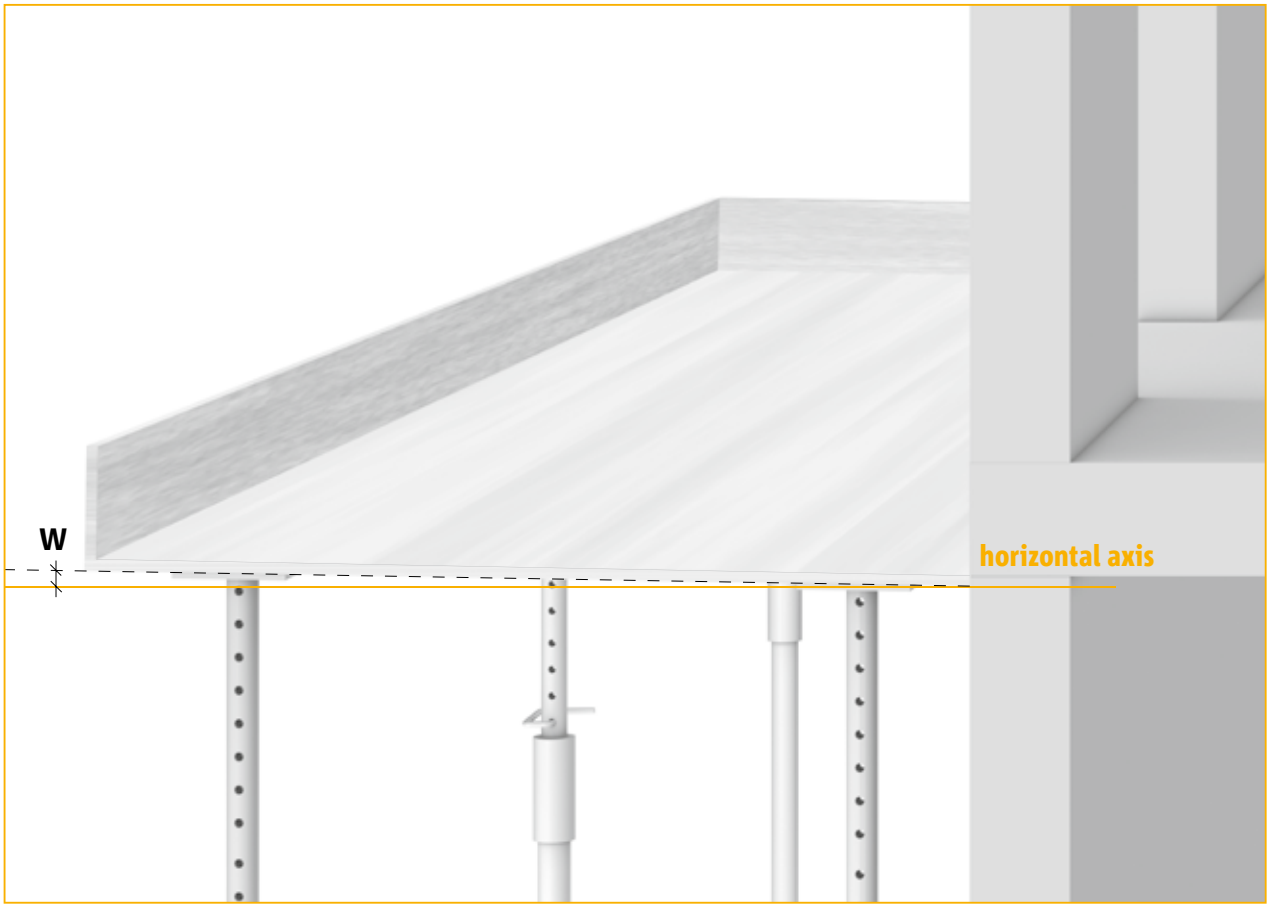
With the Schöck Isokorb® being located between the floor slab and the balcony slab, deformation w_2 from the Schöck Isokorb® must be taken into consideration in addition to the deformation w_1 of the balcony slab. Please see the product chapters for specification of the deformation factor tan α.



The Schöck Isokorb® tension bar and pressure module act as springs

Schöck Isokorb® Load-bearing Behavior

Deflection behavior



Camber of formwork when concreting

Camber

In order to optimise the deformation of the balcony, the formwork can be cambered during installation. Usually, camber will be designed to counter deformation due to self weight, allowing tolerance of ± 5 mm. Drainage direction should be taken into account. Camber should be reduced for outward drainage and increased for inward drainage.

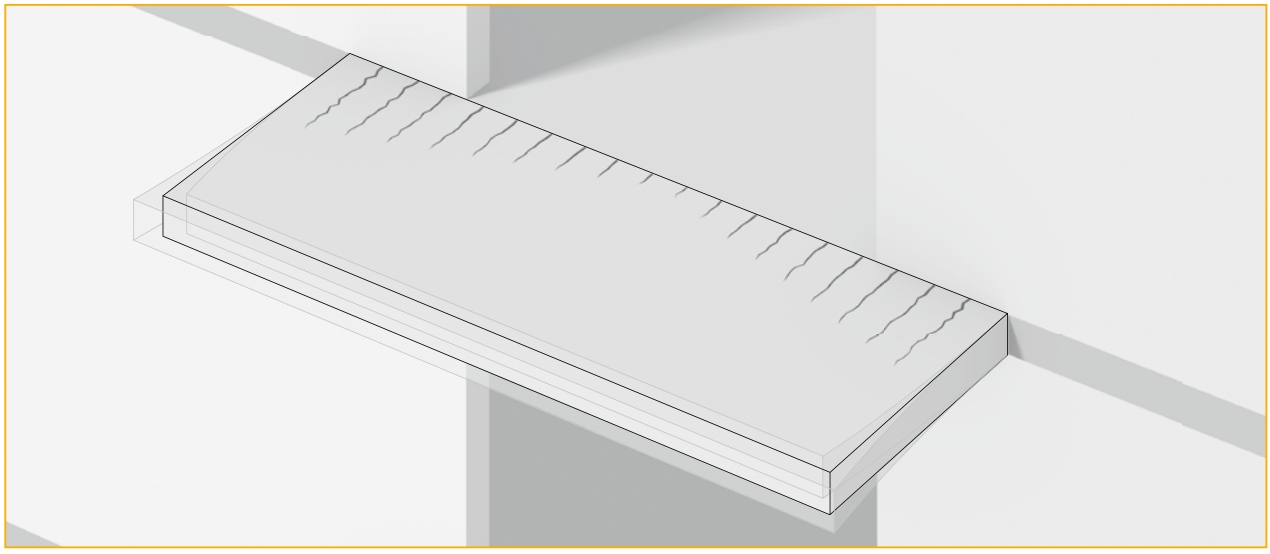
The total Camber "w" for a balcony depends on several factors:

- the amount of deformation from the angle of rotation of the interior slab
- the amount of deformation of the balcony slab,
- the amount of deformation from the Schöck Isokorb® and
- the drainage direction of the balcony.

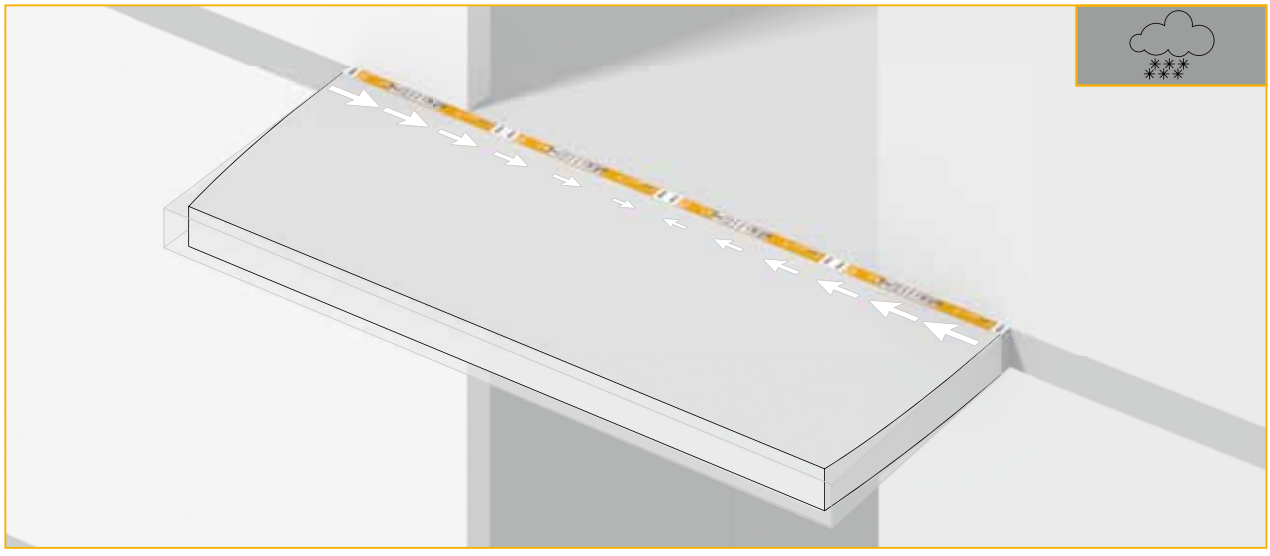
All these points must be taken into consideration when determining the camber.

Schöck Isokorb® Load-bearing Behavior

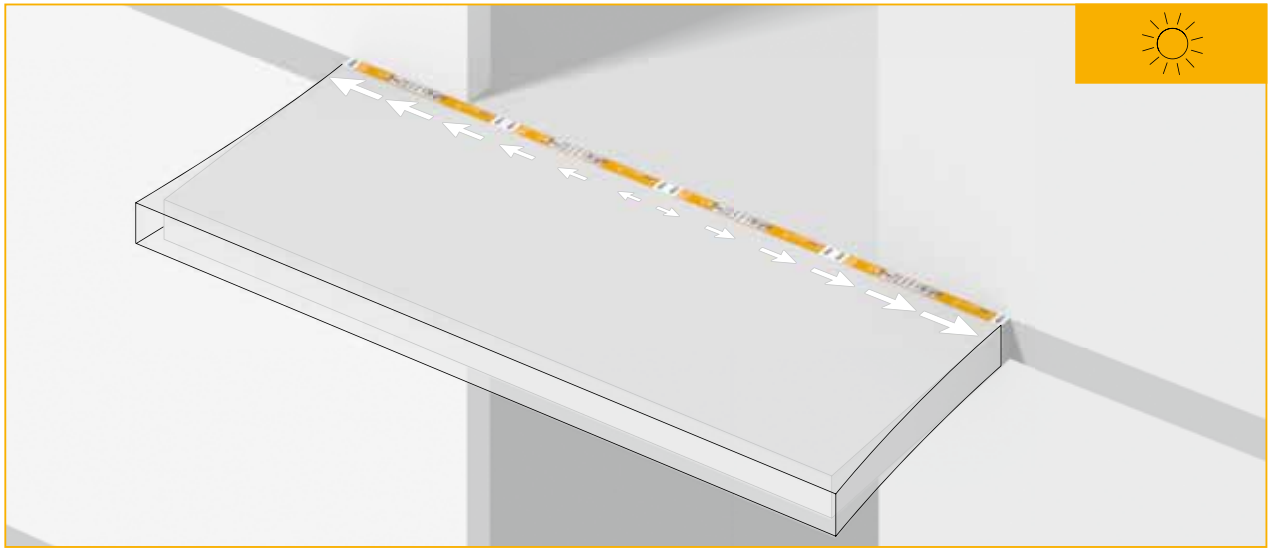
Behavior in the event of temperature changes – expansion joints



Temperature deformation and possible crack formation in a balcony slab without Schöck Isokorb®



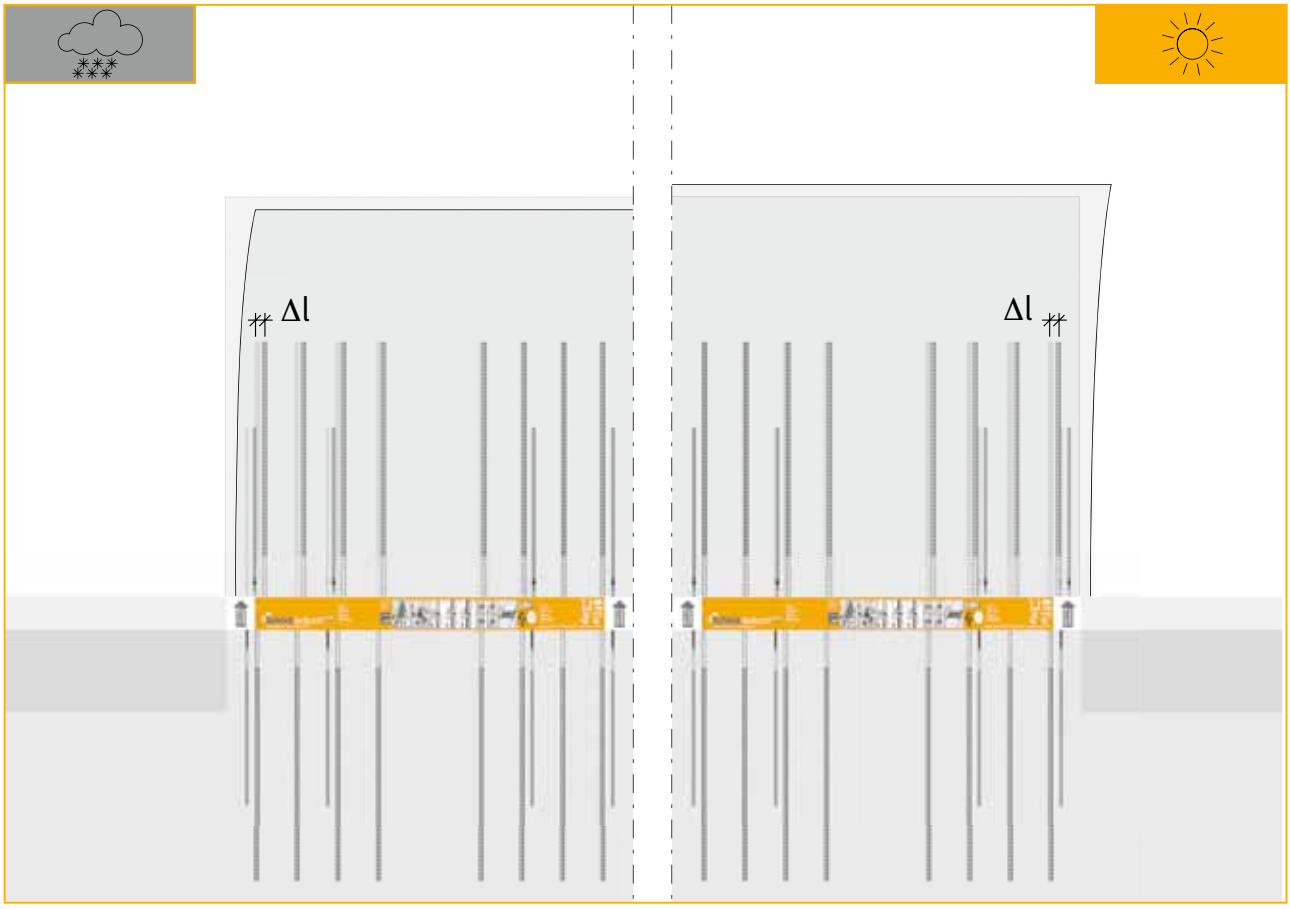
Contraction of a balcony slab due to cooling, horizontal compression load on Schöck Isokorb®



Expansion of a balcony slab due to heating up, horizontal tension load on Schöck Isokorb®

Schöck Isokorb® Load-bearing Behavior

Behavior in the event of temperature changes – expansion joints



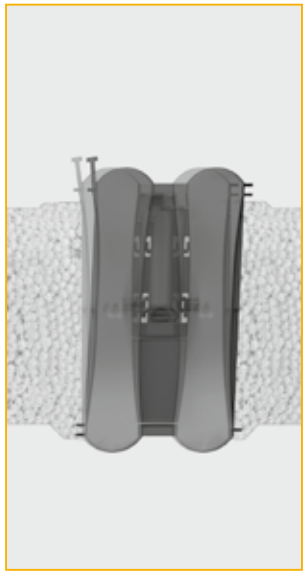
Deformation under thermal loads

A balcony slab expands when heated up and contracts when cooled down. With a continuous balcony slab, cracks can occur in the concrete slab due to constraint. One result can be the ingress of moisture.

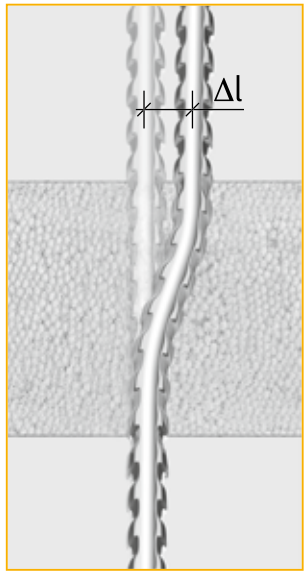
The Schöck Isokorb® forms an expansion joint. The tension bars and the shear force bars in the Schöck Isokorb® repeatedly deflect slightly across their axis.

Fatigue tests were conducted for the following loads applied to the Schöck Isokorb® type CM
100 load reversals, movement distance ±2.0 mm,
2000 load reversals, movement distance ±1.7 mm,
20000 load reversals, movement distance ±1.1 mm.

For a symmetrical balcony slab, the tension bars and shear force bars of the Schöck Isokorb® at the edges of the balcony slab deflect more than the bars in the centre of the balcony slab.



HTE module deflection



Tension bar deflection

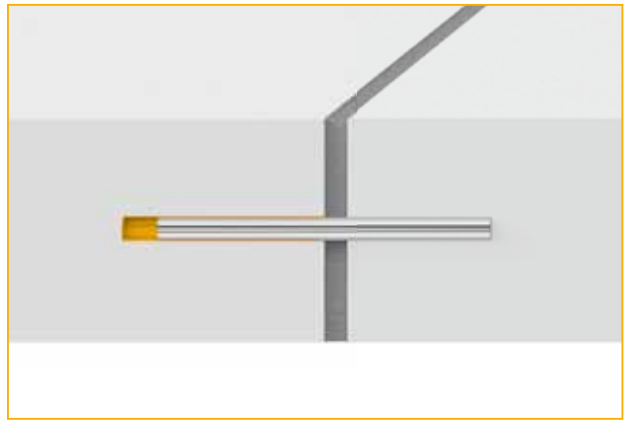
Schöck Isokorb® Load-bearing Behavior

Behavior in the event of temperature changes – expansion joints

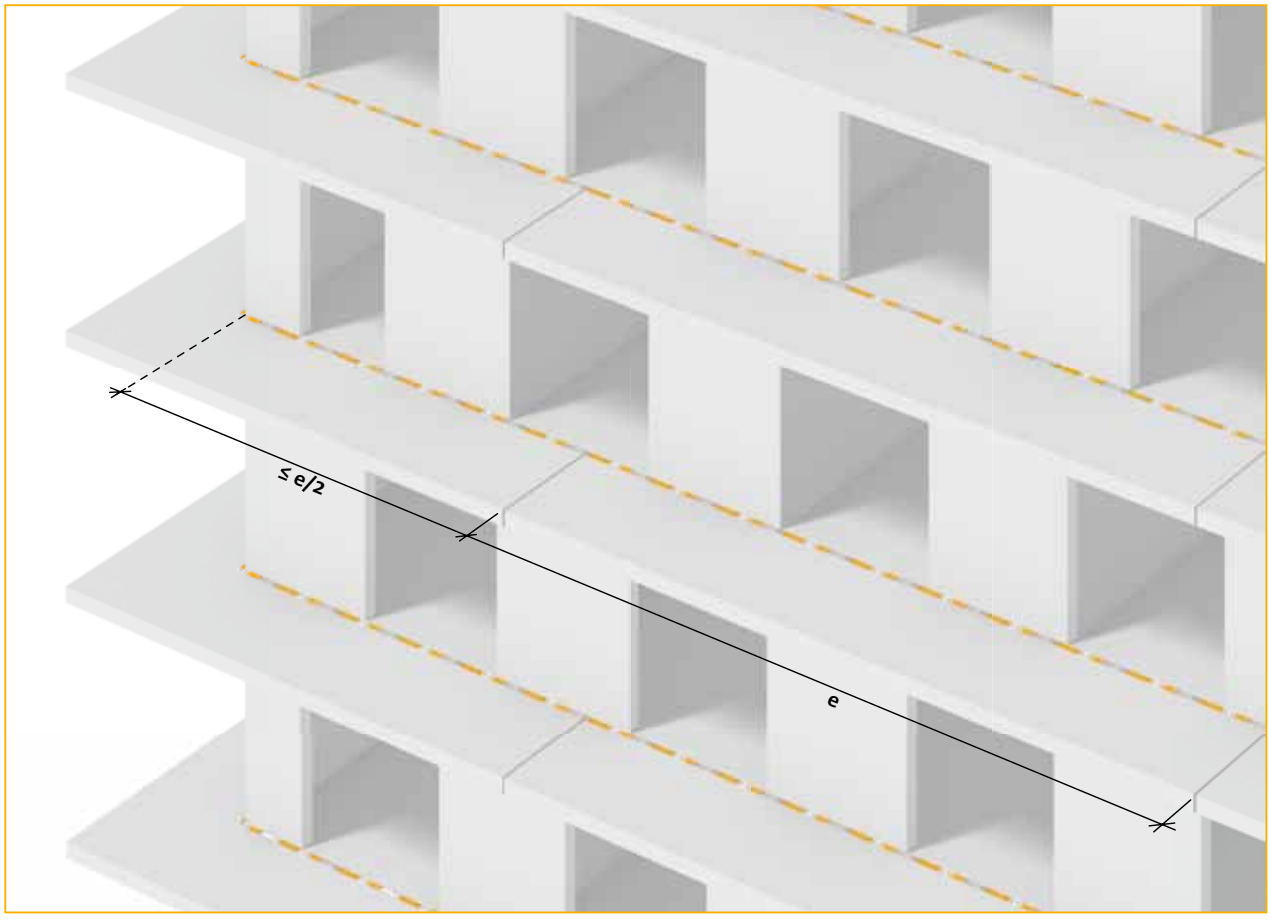
Therefore, we recommend limiting the length of the balcony slab to a certain size, depending on the Schöck Isokorb® type. This must be verified by the EOR and adjusted if necessary.

For corner balconies, only half of the length should be used, starting from the corner.

If a balcony slab is longer, expansion joints must be provided. To form an expansion joint, the slab is cut and a Schöck dowel type ESD is arranged between the two slabs in order to prevent different slab levels.

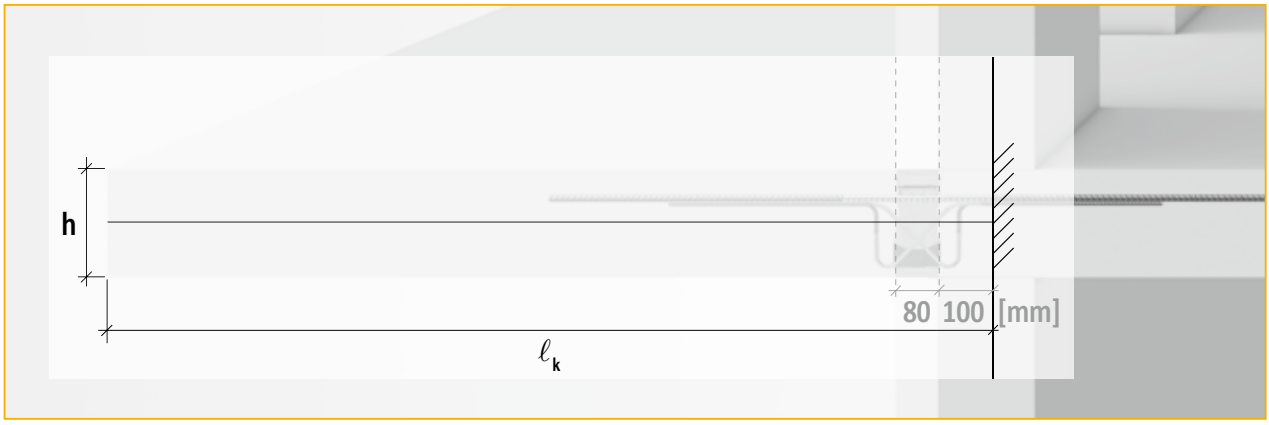


Expansion joint formation



Schöck Isokorb® type CM: recommended maximum expansion joint spacing

Schöck Isokorb® Load-bearing Behavior
Vibration behavior



Schöck Isokorb® type CM: Flexural slenderness

In the context with balconies, the term “slenderness” describes the ratio of slab thickness to cantilever length. This slenderness will influence the vibration behaviour of the balcony slab. Therefore, we recommend limiting the slenderness; for further details, please see the product chapter.

Structural Thermal Break

Schöck Isokorb® Installation Guidelines

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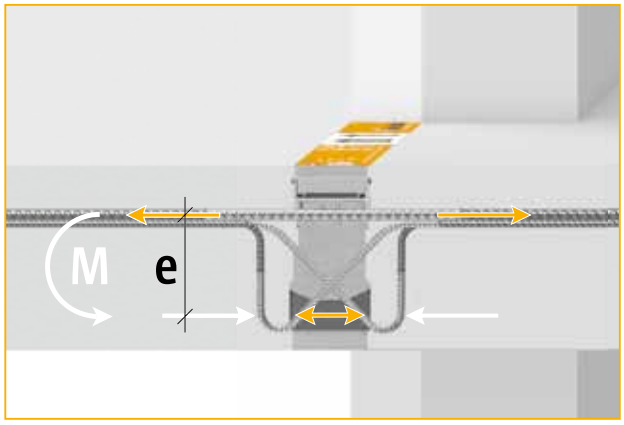
Schöck Isokorb® Installation Guidelines

Installation orientation



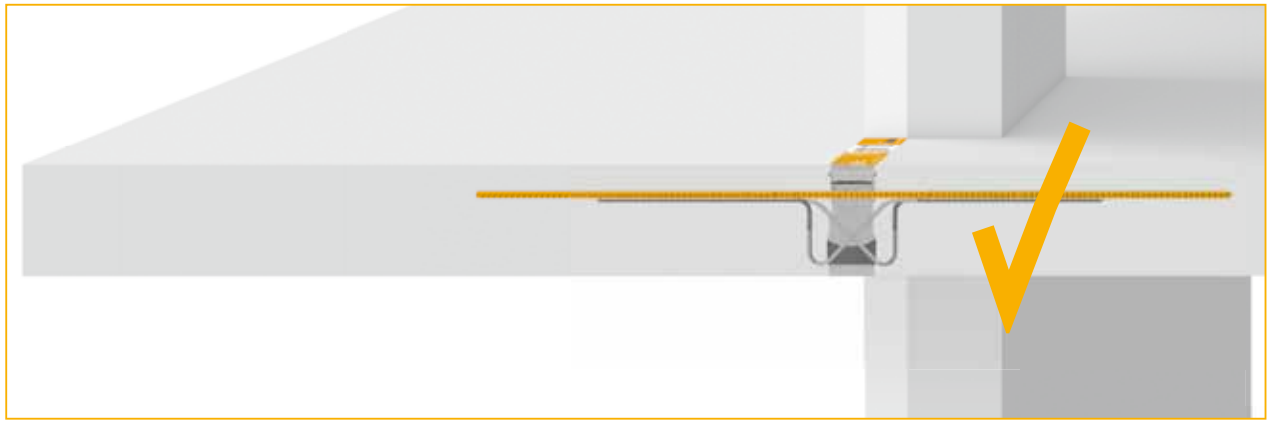
Schöck Isokorb® type CM: Upper tension bar moment load resistance required.

The Schöck Isokorb® type CM does not have a symmetrical design. Attention must therefore be paid to the installation orientation - the tension bar must be on top.

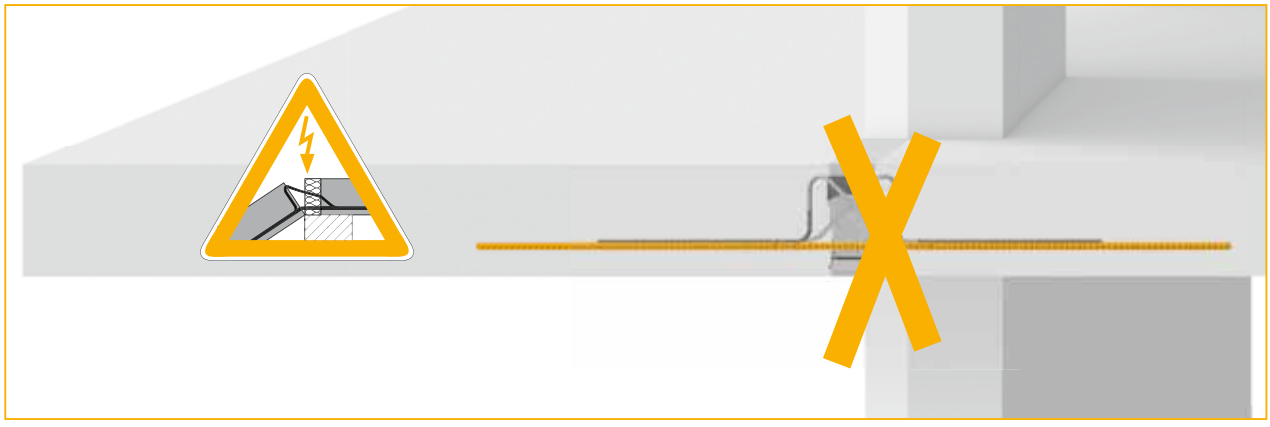
Cross-sections must be shown in the plans indicating the location and orientation of the Schöck Isokorb®.

Warning:

- Always install the Schöck Isokorb® in the correct position. The TOP part of the Schöck Isokorb® is clearly marked as such and must be visible when installation is complete.
- If the Schöck Isokorb® is reserved and instead of the marking "TOP FACE" the marking "Bottom" is visible, then danger to materials and bodily injury may result. The Schöck Isokorb® will fail and the balcony may break off.
- The tension bar must be on top when it is installed! If it is not on top, no moment can be transmitted.
  The balcony will no longer be able to carry the required loads and will be UNSAFE.



Schöck Isokorb® type CM correct installation: Tension bar on top



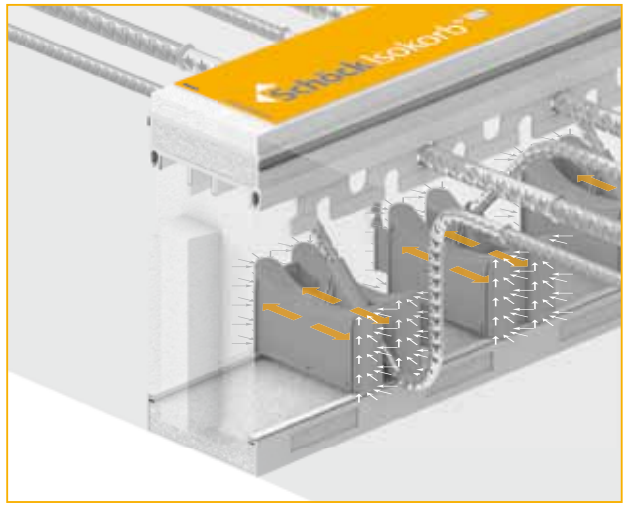
Schöck Isokorb® type CM wrong installation: Tension bar at bottom

Schöck Isokorb® Installation Guidelines

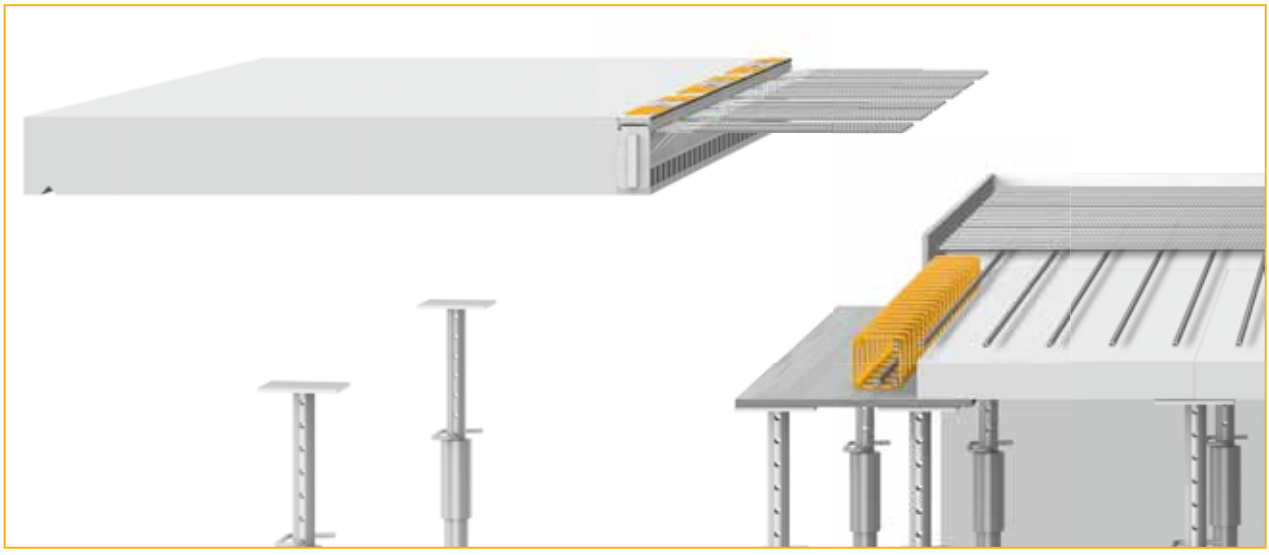
Installation with prefabricated floor elements or interior slab joists

The Schöck Isokorb® can be used with prefabricated or precast parts. It can be installed directly in the balcony slab in the prefabrication shop and supplied to the building site together with the concrete slab.

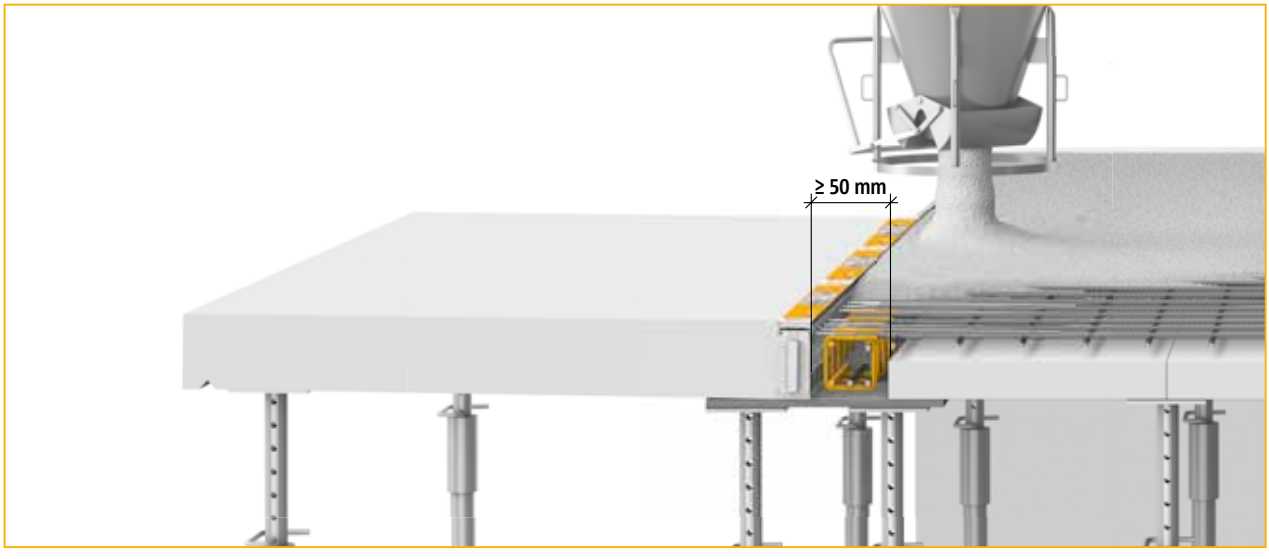
Force transfer from the pressure bearings into the surrounding concrete is achieved via the tight fit between the pressure bearings and the freshly poured in-situ concrete. Therefore, it must be ensured on the construction site that a casting joint of at least 50 mm is formed adjacent to the pressure bearing for type CM. A different distance may be required for other types in the Schöck Isokorb® product range. This is specified in the product chapter.



Schöck Isokorb® type CM: tight fit of the HTE module



Schöck Isokorb® type CM: required casting joint installation.



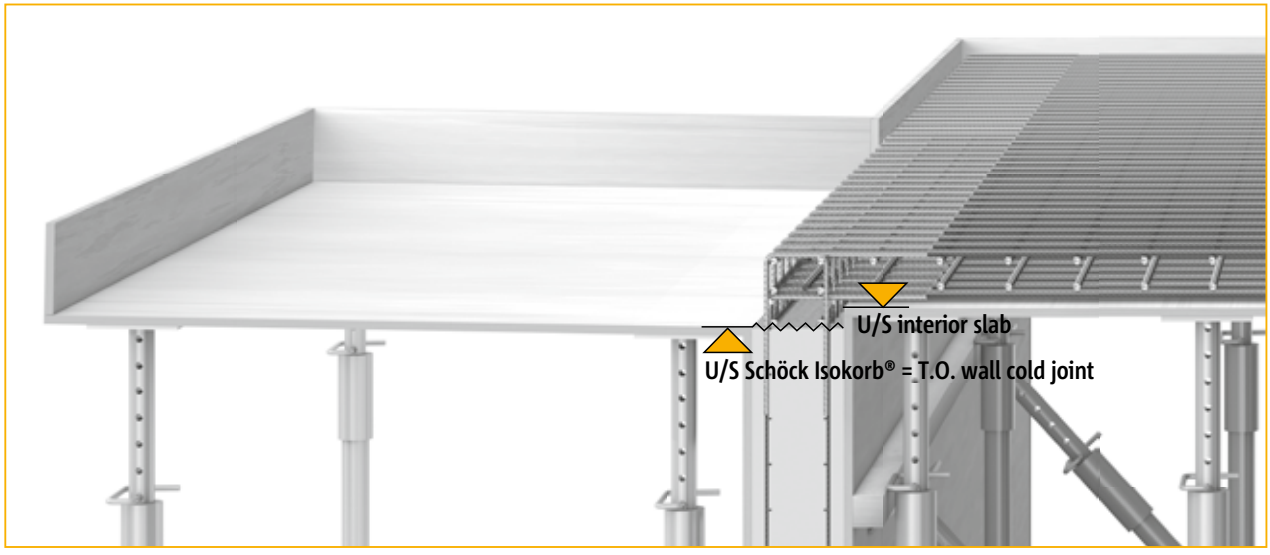
Schöck Isokorb® type CM: the casting joint

Schöck Isokorb® Installation Guidelines

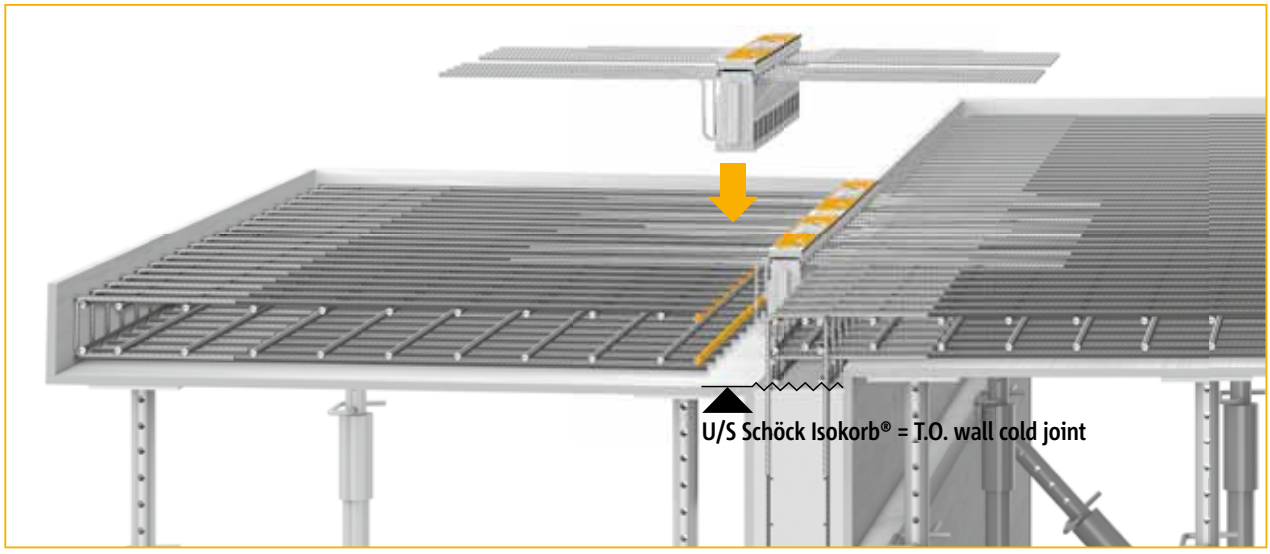
Installation

For installations in cast in place concrete, please note as follows:

Arrange cast-in-place reinforcement, place Schöck Isokorb®, pour concrete, follow curing time requirements in accordance with national standards, support for an additional 28 days. It must be ensured that there is a tight fit between the pressure bearings and the freshly poured concrete! Therefore, concreting joints must be arranged below the lower edge of the Schöck Isokorb®. Detailed installation instructions for the products are shown in the installation section.



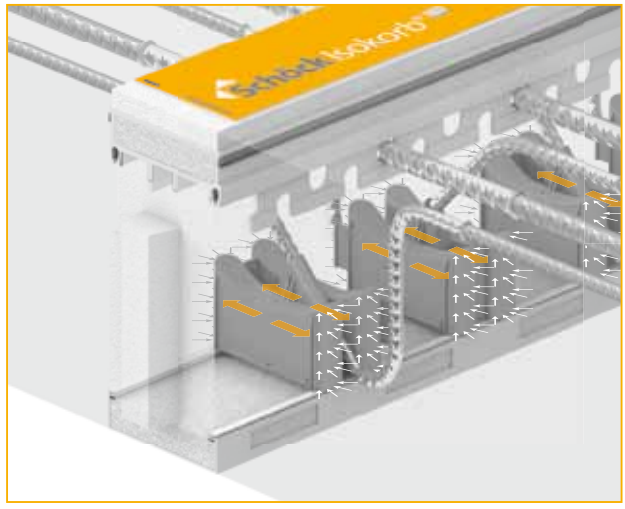
Schöck Isokorb® type CM: Pay attention to concreting joint during installation (direct mounting).



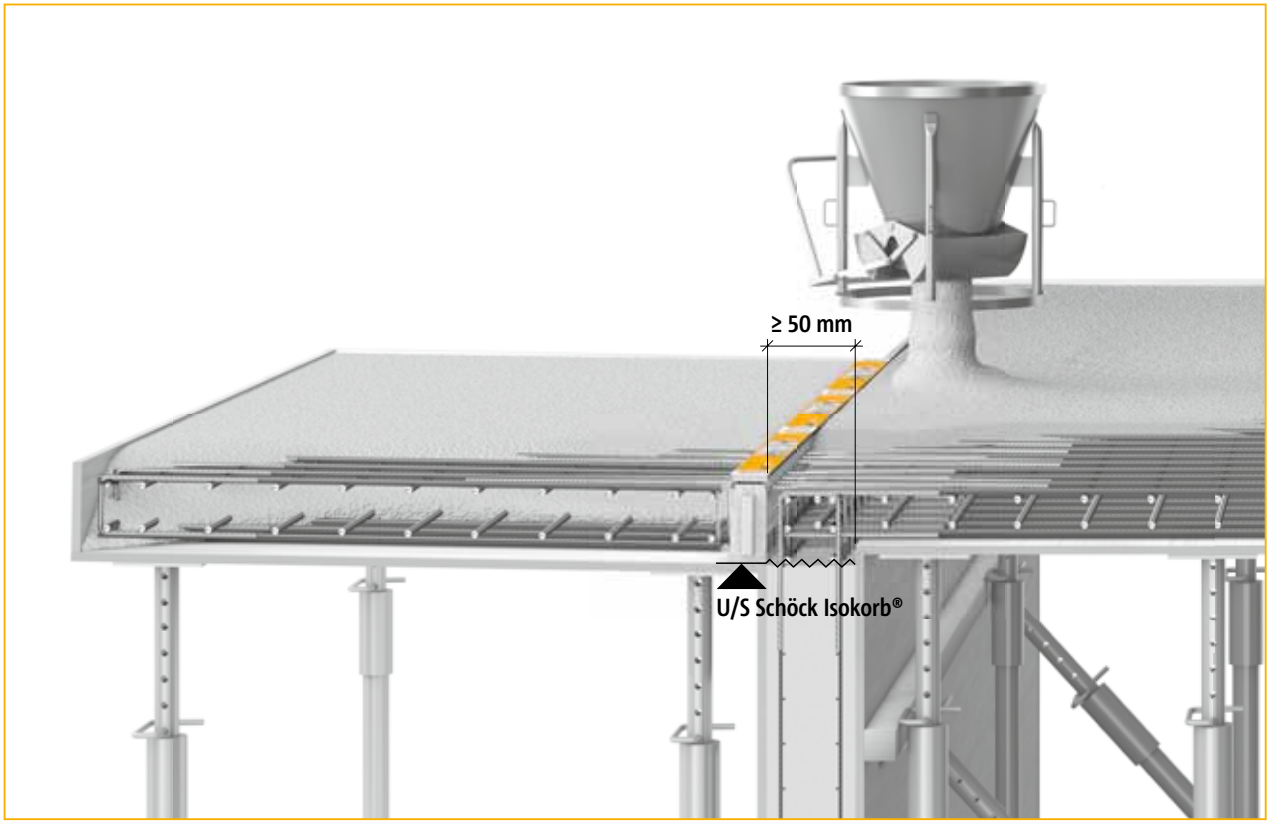
Schöck Isokorb® type CM: Installation (direct mounting).

Schöck Isokorb® Installation Guidelines
Installation

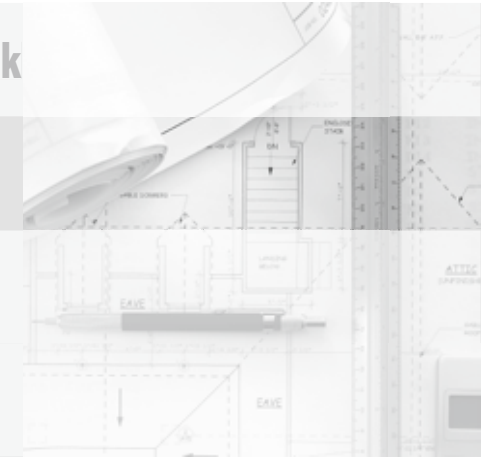
Force transfer from the pressure bearings into the surrounding concrete is achieved via the tight fit between the pressure bearings and the freshly poured in-situ concrete. Therefore, it must be ensured on the construction site that a casting joint of at least 50 mm is formed adjacent to the pressure bearing for type CM. A different distance may be required for other types in the Schöck Isokorb® product range. This is specified in the product chapter.



Schöck Isokorb® type CM: HTE module tight fit

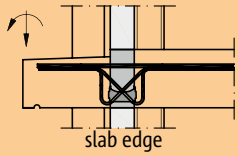


Schöck Isokorb® type CM: required casting joint installation



Schöck Isokorb® Products

Schöck Isokorb® Type summary

Schöck Isokorb® C-Line-Special (slab edge)	
Type CM-special slab edge  	Please refer to our Design Support Department.

Type CM-special constructions

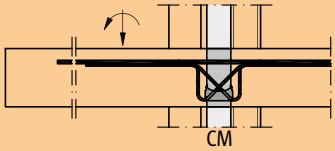
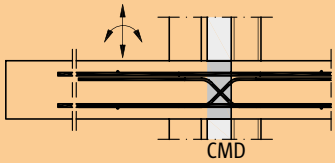
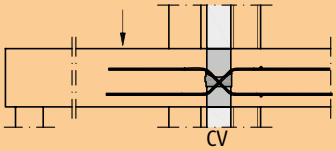
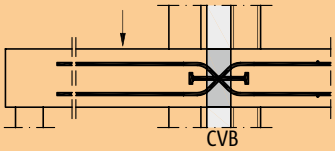
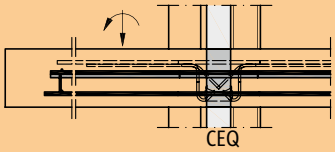
Some connections cannot be put into practice with the standard products shown in this manual. For such cases, special versions are available from the Design Department by request (for contact see pg. 3). This also applies to additional requirements as a result of prefabricated or precast construction methods (e.g. restrictions because of manufacturing conditions or transportation width), which may be fulfilled using threaded socket bars.

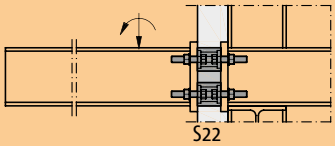
Bending of reinforcing steel

The bending of bars that might be required for special structures is carried out in our factory and the final assembly of the Schöck Isokorb® is completed. This process is monitored to ensure that the conditions of the NBC-2010 AND CSA A23.3-04 with regard to the bending of reinforcing steel are complied with. Attention: if Isokorb® reinforcing steel is subsequently bent on site or bent and re-straightened in contravention of the applicable regulations, adherence to and monitoring of the relevant conditions is outside the responsibility of Schoeck Canada Inc. and Schöck Bauteile GmbH, the manufactorer of Schöck Isokorb. In such cases, our warranty is rendered null and void.

Schöck Isokorb® Products

Schöck Isokorb® type summary

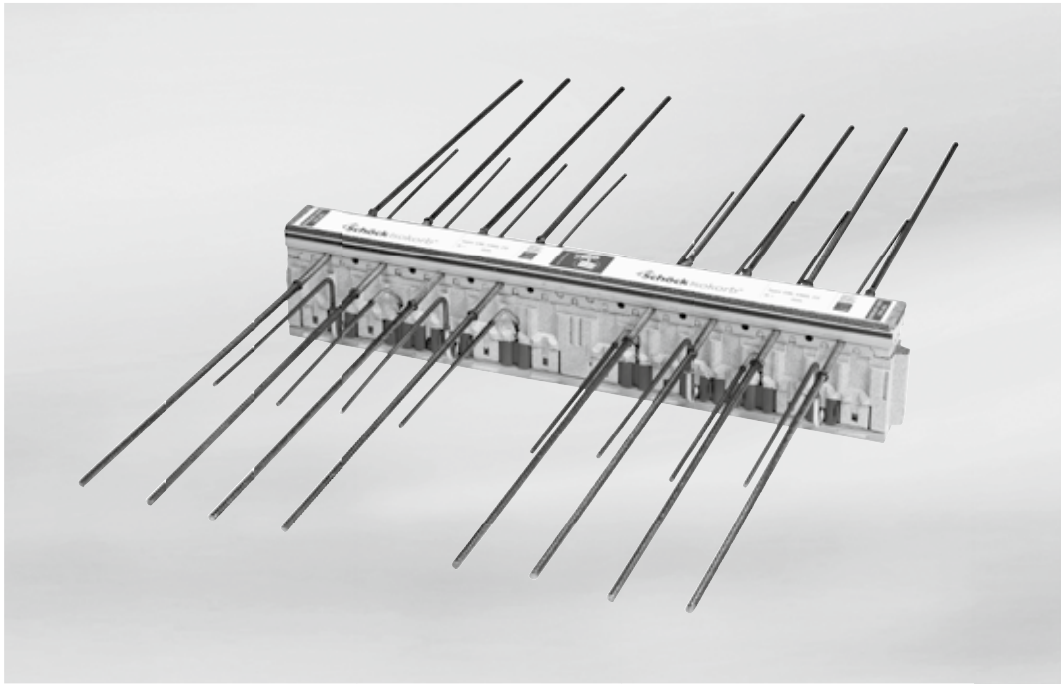
Schöck Isokorb® C-Line (concrete slabs)		Page
Type CM Free cantilevered balconies  CM		Product 47 Structural design 119 Installation guidelines 128
Type CMD Free cantilevered balconies and "run-through slabs"  CMD		Product 59 Installation guidelines 133
Type CV Supported balconies  CV		Product 71 Installation guidelines 137
Type CVB Supported balconies with punctual load peaks  CVB		Product 83 Installation guidelines 141
Type CEQ Cantilevered balconies with seismic loads (use of CEQ only in interaction with the basic types)  CEQ		Product 93 Installation guidelines 144

Schöck Isokorb® S-Line (steel beams)		Page
Type S22 Free cantilevered structures  S22		Product 99 Installation guidelines 145

Schöck Isokorb®
Notes for use and structural design

- The Schöck Isokorb® products are load-bearing thermal insulating connection elements typically used to connect an exterior structural member (e.g. balcony slab, canopy) to an interior structural member (e.g. floor slab). The Schöck Isokorb® is specifically used in reinforced concrete structures to connect 180 to 250 mm thick exterior cantilever concrete (balcony) slabs to equal thickness interior slabs while forming a thermal break, transferring load and maintaining full structural integrity. This product contributes to the overall thermal insulation of the building envelope by reducing cold bridging between internal and external elements.
- Construction with Schöck Isokorb® C-line provided in this technical manual has been evaluated in accordance with the CSA Standard A23.3.-04 Design of Concrete Structures by Morrison Hershfield Limited (Schöck Isokorb® Product Engineering Design Review for Canadian Market, evaluation report, dated March 14, 2012)..
- The design capacities of the Schöck Isokorb® type S22 have been independently checked and approved as compliant with CSA S16-09. The structural engineering firm, Fast + Epp, performed assessment calculations to CSA S16-09 of Schock Isokorb® type S22.
- With different concrete strengths (e.g. balcony 30 MPa, interior slab 25 MPa) the weaker concrete is critical with regard to Schöck Isokorb® designing.
- The concrete strength is based on standard test cylinder specified in CSA A23.3-04.
- In the following product pages, only Schöck Isokorb® reinforcement is shown. Slab reinforcement is not shown for clarity.

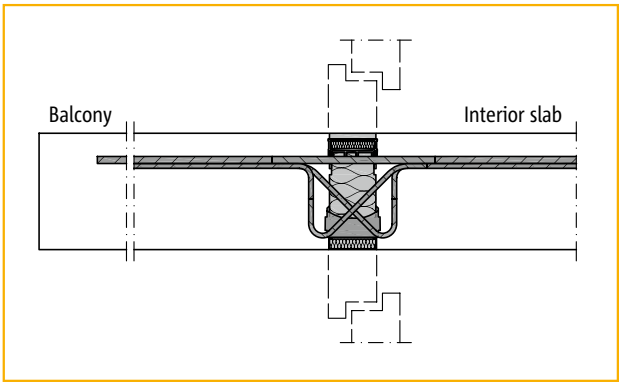
Schöck Isokorb® type CM



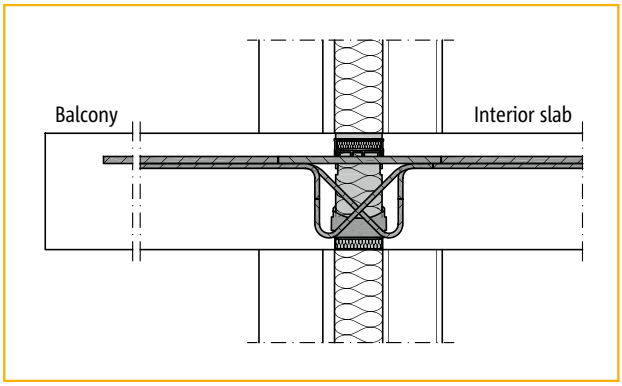
Schöck Isokorb® type CM

The Schöck Isokorb® type CM is suitable for cantilevered reinforced concrete slabs. (C for concrete slab)
It transmits negative moment (M) and positive shear force.

Schöck Isokorb® type CM
Section/element arrangement



Schöck Isokorb® type CM with window wall systems



Schöck Isokorb® type CM with steel studs, facing shell and insulation layer in between

Position of Schöck Isokorb® type CM

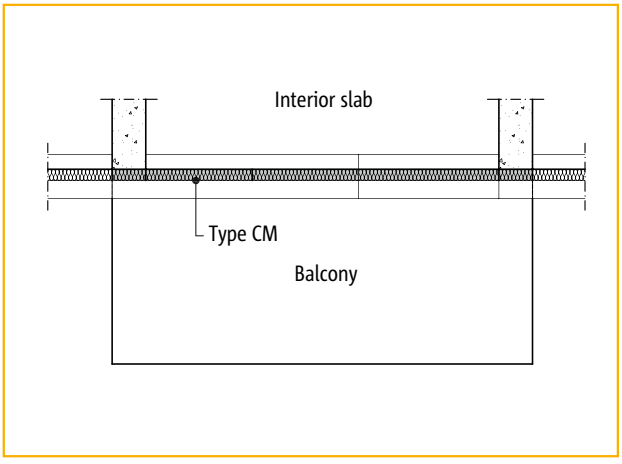
The Schöck Isokorb® type CM should be located in the insulating layer.

Orientation of the Schöck Isokorb® type CM

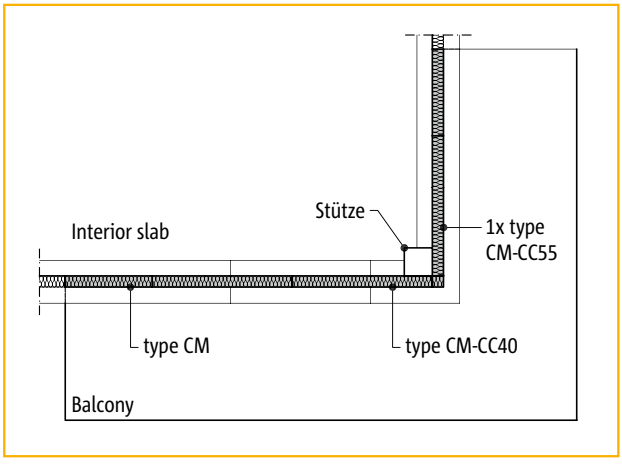
Attention: the Schöck Isokorb® type CM does not have a symmetrical design.

- The tension bar must be on top.
- Pay attention to installation orientation and show a cross-section view on the design drawings.
- The Schöck Isokorb® type CM has the same design at the balcony side and the interior slab side.

Element arrangement



Schöck Isokorb® type CM Cantilever balcony



Schöck Isokorb® type CM Balcony with outer corners

Note:

- In the presence of horizontal loads, e.g. from earthquakes, Schöck Isokorb® module CEQ must be used.

Schöck Isokorb® type CM
Slab geometry/expansion joints

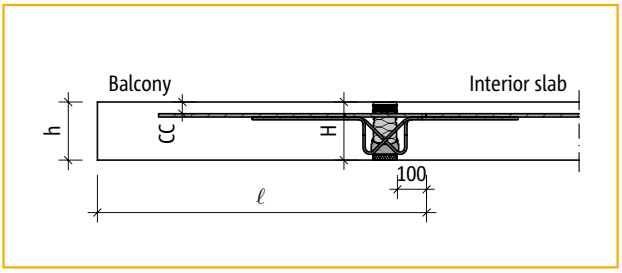
Recommended maximum cantilever length

The following maximum cantilever lengths "ℓ" are recommended in order to avoid excessive vibration in the balcony slab.

Concrete cover for tension bars	max ℓ [m] with Isokorb® height H [mm]							
	180	190	200	210	220	230	240	250
CC = 40 mm	1.95	2.10	2.25	2.39	2.54	2.68	2.83	2.98
CC = 55 mm		1.88	2.03	2.17	2.32	2.46	2.61	2.76

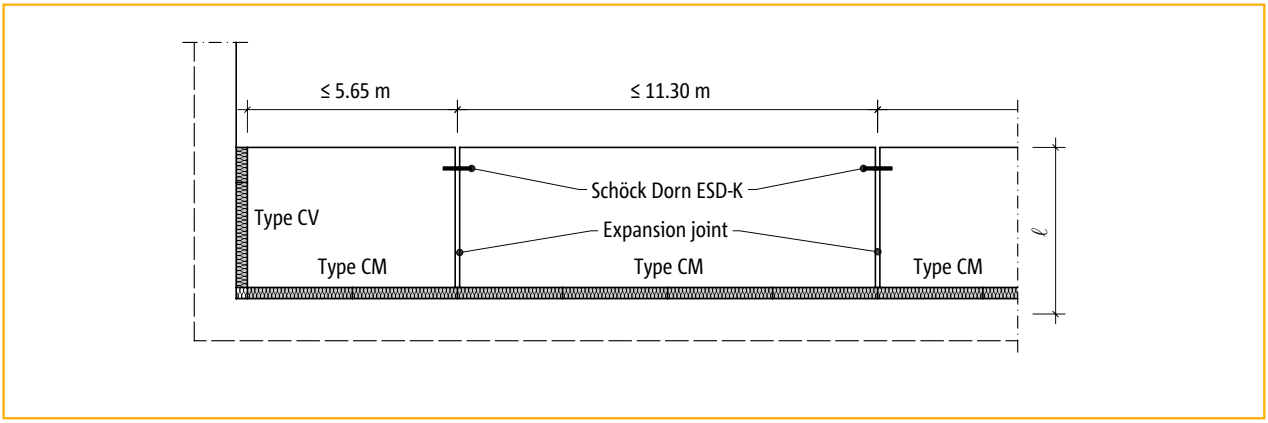
Cantilever length for the structural calculations

The support of the balcony is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Expansion gaps (recommended balcony length)

The expansion joint spacing shown below corresponds to a temperature difference of ΔT = 70 °C.



Plan view: Maximum expansion joint spacing, Schöck Isokorb® type CM

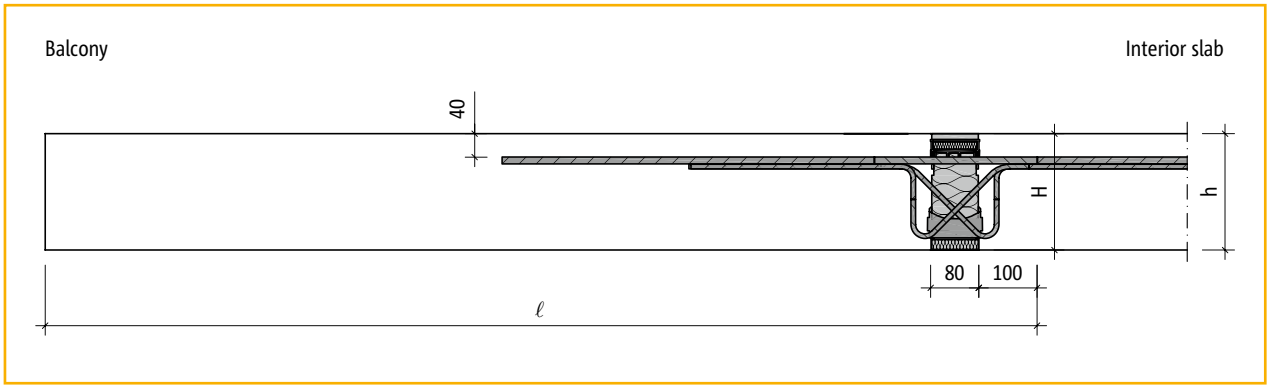
Note:

- The maximum expansion joint spacing must be verified by the EOR.
- The expansion gap must be free to deform in the longitudinal direction. This can be achieved, for example, using a Schöck Dorn ESD-K (made from stainless steel A4).

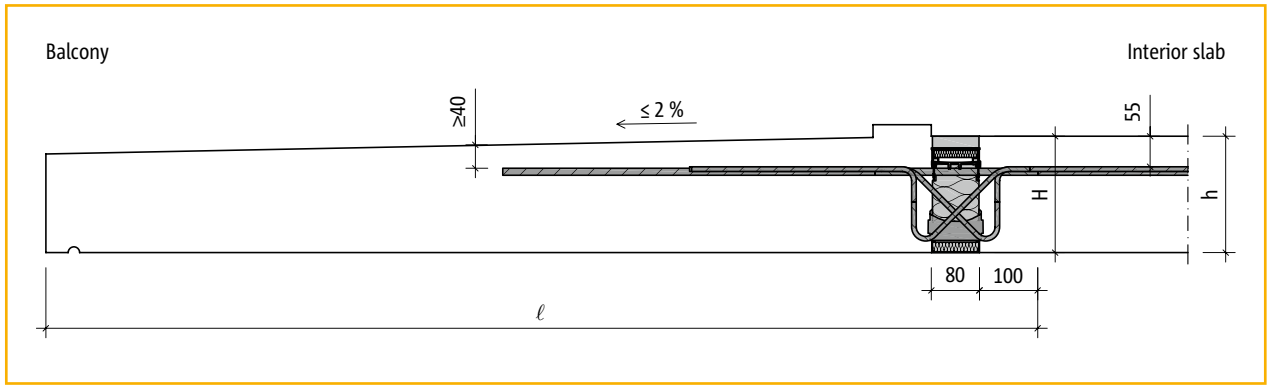
Schöck Isokorb® type CM
Concrete cover/type designation

Concrete cover CC

The concrete cover of the Schöck Isokorb® type CM is set to 40 mm (CC40) or 55 mm (CC55). We recommend choosing the CC55 concrete covering for balcony slabs with a sloping surface. This allows the surface of the balcony slab to be sloped by 2%.



Concrete cover with level balcony slab



Concrete cover with sloped balcony slab

Type designation in design drawings

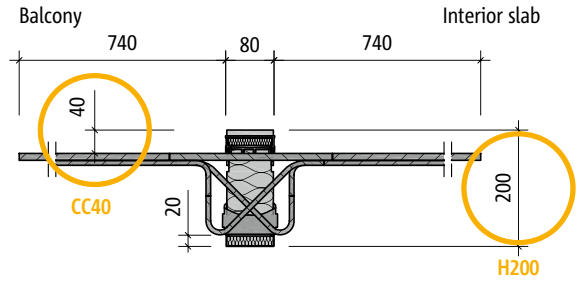
The following type designation specifies the Schöck Isokorb® type that is required.
The type designation is indicated on the design drawings.
The type designation is printed on the sticker of the Schöck Isokorb® type as a recognition feature.

Concrete Strength ≥ 30MPa		Schöck Isokorb® type		
Concrete cover CC = 40 mm	Isokorb® height H [mm]	CM10	CM20	CM
Ultimate (factored) moment resistance M_{Ed} [kNm/m]	180	22.1	29.5	36
	190	24.5	32.6	40
	200	26.8	35.7	44
	210	29.1	38.8	48
	220	31.4	41.8	52
	230	33.7	44.9	56

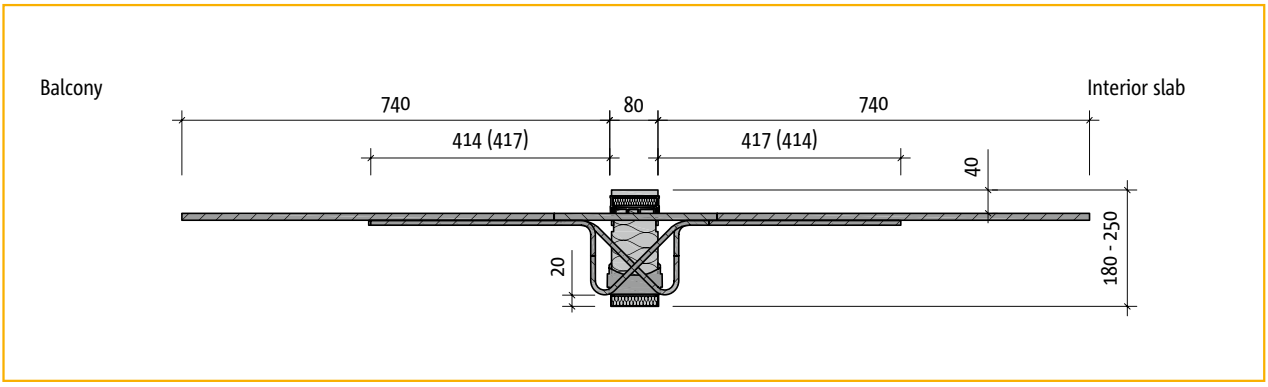
Type designation in design drawings

With fire protection **CM20-CC40-H200-R120**

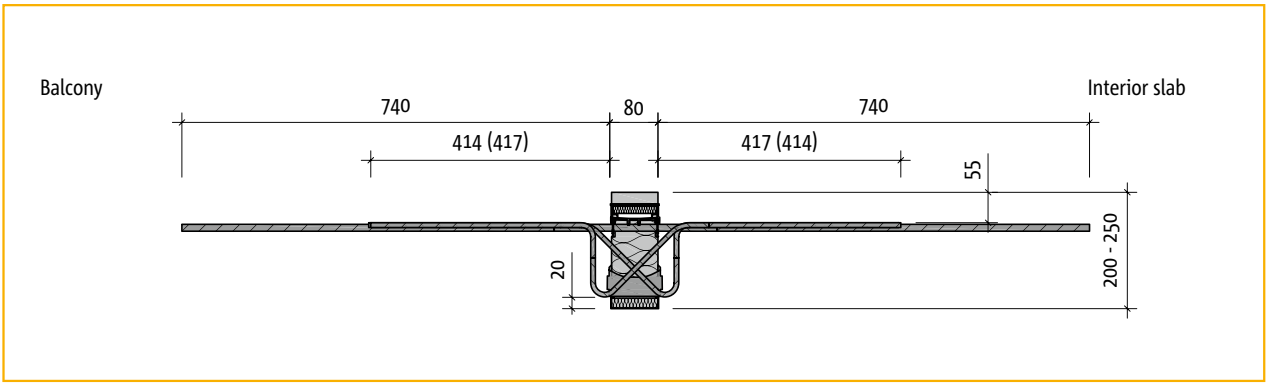
- CM20 – Type/load capacity
- CC40 – Concrete cover
- H200 – Schöck Isokorb® height
- R120 – Fire protection



Schöck Isokorb® type CM
Product cross-section



Product cross-section for Schöck Isokorb® type CM10 to CM40, concrete cover CC40



Product cross-section for Schöck Isokorb® type CM10 to CM40, concrete cover CC55

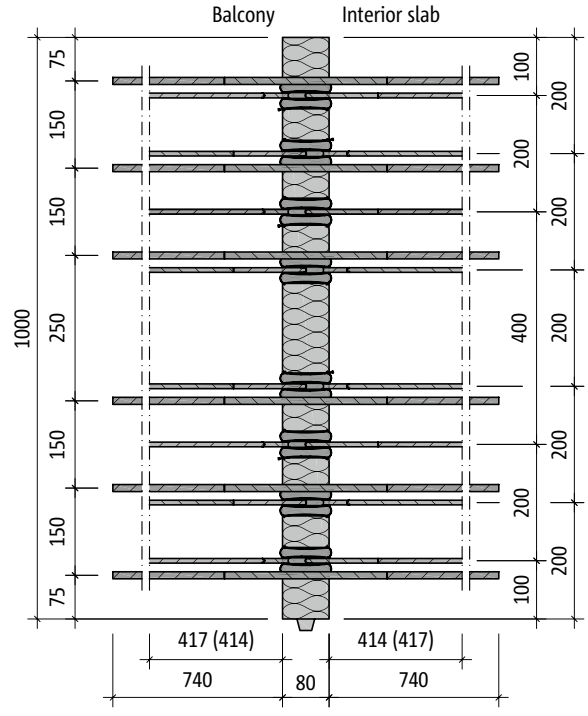
Schöck Isokorb® length and configuration

Schöck Isokorb® type	CM10	CM20	CM30	CM40
Isokorb® length [m]	1.00	1.00	1.00	1.00
Tension bars	6 ø 12	8 ø 12	10 ø 12	12 ø 12
Shear force bars	4 ø 8+4 ø 8	4 ø 8+4 ø 8	4 ø 8+4 ø 8	4 ø 8+4 ø 8
Pressure bearings (pcs.)	8	10	12	14

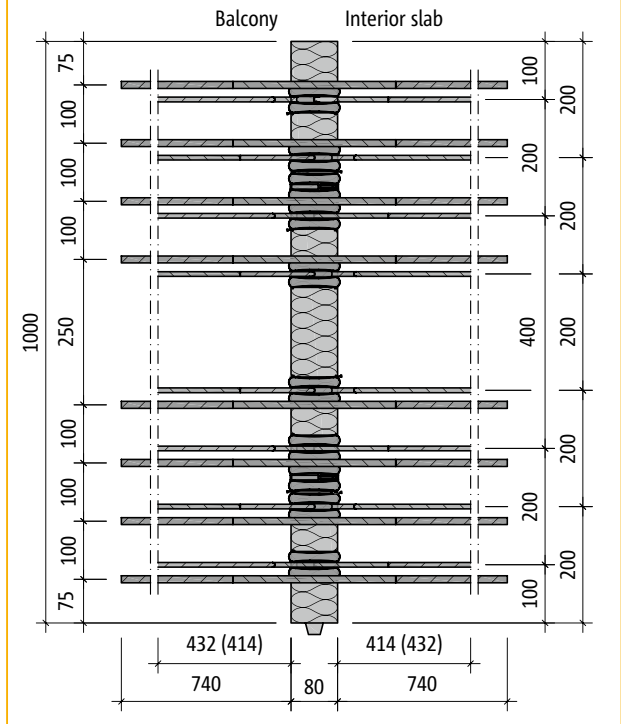
Note:

- The product cross-sections of the 4 load capacities (CM10, CM20,CM30,CM40) of the Schöck Isokorb® type CM are identical for the respective concrete cover. The load capacities of the Schöck Isokorb® type CM vary in the number of tension bars, shear force bars and HTE pressure bearings.
- The Schöck Isokorb® type CM may be split at the non-reinforced locations. The spacing of the pressure elements from the free edge of the reinforced concrete slab must be at least 50 mm, and the axis spacing of the shear force bars must be at least 100 mm and no more than 150 mm.
- The shear force bars have differing lengths as shown in brackets.

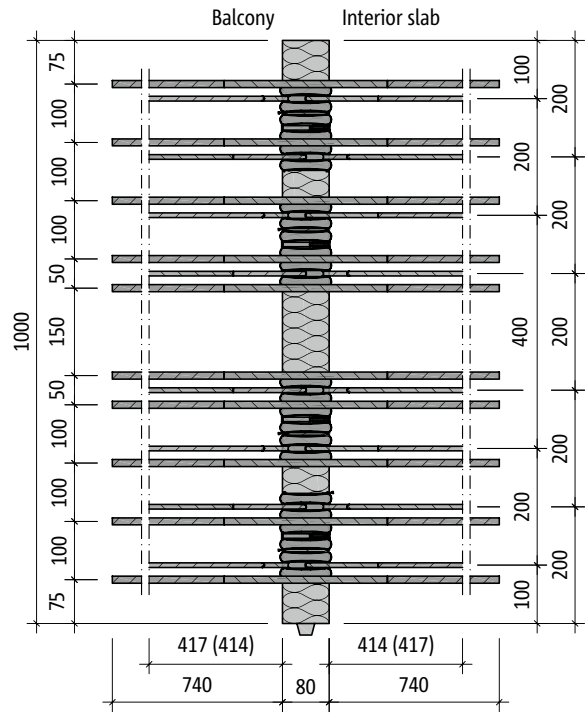
Schöck Isokorb® type CM
Overhead view of product



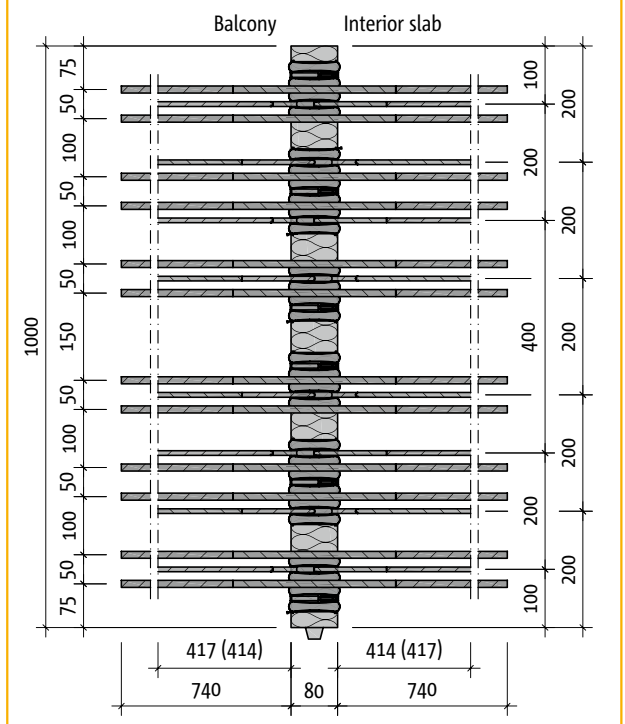
Overhead view of Schöck Isokorb® type CM10



Overhead view of Schöck Isokorb® type CM20



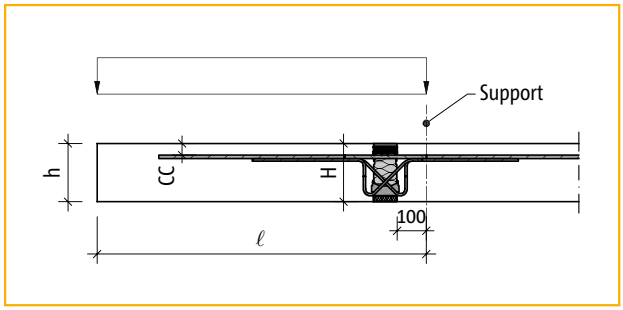
Overhead view of Schöck Isokorb® type CM30



Overhead view of Schöck Isokorb® type CM40

Schöck Isokorb® type CM
Design

The support is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Product selection table as per CSA A23.3-04

Concrete Strength ≥ 30MPa		Schöck Isokorb® type			
Concrete cover CC = 40 mm	Isokorb® height H [mm]	CM10	CM20	CM30	CM40
Ultimate (factored) moment resistance M_r[kNm/m]	180	22.1	29.5	36.9	44.3
	190	24.5	32.6	40.8	48.9
	200	26.8	35.7	44.6	53.5
	210	29.1	38.8	48.5	58.1
	220	31.4	41.8	52.3	62.8
	230	33.7	44.9	56.1	67.4
	240	36.0	48.0	60.0	72.0
	250	38.3	51.1	63.8	76.6
Ultimate (factored) shear resistance V_r [kN/m]	180-250	48.3	48.3	48.3	48.3

Product selection table as per CSA A23.3-04

Concrete Strength ≥ 30MPa		Schöck Isokorb® type			
Concrete cover CC = 55 mm	Isokorb® height H [mm]	CM10	CM20	CM30	CM40
Ultimate (factored) moment resistance M_r[kNm/m]	200	23.3	31.1	38.8	46.6
	210	25.6	34.1	42.7	51.2
	220	27.9	37.2	46.5	55.8
	230	30.2	40.3	50.4	60.4
	240	32.5	43.4	54.2	65.1
	250	34.8	46.5	58.1	69.7
Ultimate (factored) shear resistance V_r [kN/m]	200-250	48.3	48.3	48.3	48.3

Notes

- With different balcony slab and floor slab concrete qualities, the weaker concrete should be used with the tables above.
- The EOR must confirm strength of the slabs at both sides of the Schöck Isokorb®.
- The shear capacity of the slabs to be verified by the EOR.
- For seismic loads the Schöck Isokorb® CM has to be combined with the Schöck Isokorb® type CEQ.
- The capacities are considering a maximum permitted bar separation according CSA A23.3-04 Cl 12.14.2.3. This has to be taken into account by the EOR.

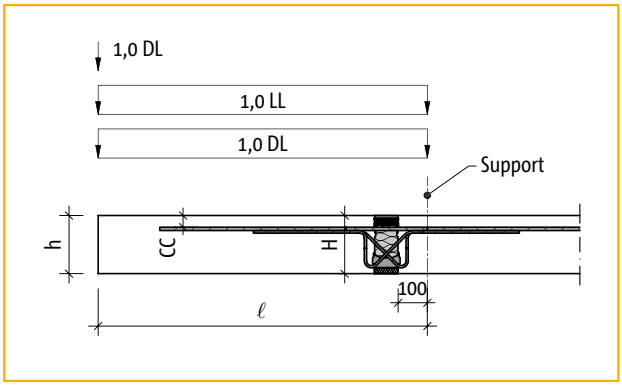
Schöck Isokorb® type CM
Deformation/camber

The deformation values in the table (tan α [%]) result from the deformation of the Schöck Isokorb® under service loads. They are used to estimate the required camber. The mathematical camber of the balcony slab formwork results from the deflection as per CSA A23.3-04 plus the deformation w_2 from the Schöck Isokorb®. The camber of the balcony slab formwork to be specified by the EOR in the design drawings (e.g. calculated overall deformation from balcony slab w_1 + interior slab angle of rotation + Schöck Isokorb® w_2) should be rounded such that the planned drainage direction is achieved (e.g. round up for drainage towards building façade; round down for drainage towards end of cantilever slab). The given equation and tan α values are for the service load case (1.0DL + 1.0LL). The designing engineer should also consider additional long term deflections as per CSA A23.3-04.

Deformation (w_2) as a result of Scöck Isokorb®

$$w_2\,[\text{mm}] = \tan\alpha \times \ell \times \frac{M_n}{\frac{M_r}{1.4}} \times \frac{1}{100}$$

tan α = obtain value from table (see page 30)
ℓ = Cantilever length [mm]
M_n = Nominal (unfactored) moment resistance [kNm/m]
The load combination to be used here is defined by the EOR.
M_r = Ultimate (factored) moment resistance [kNm/m] of the Schöck Isokorb® type CM (see page 54).

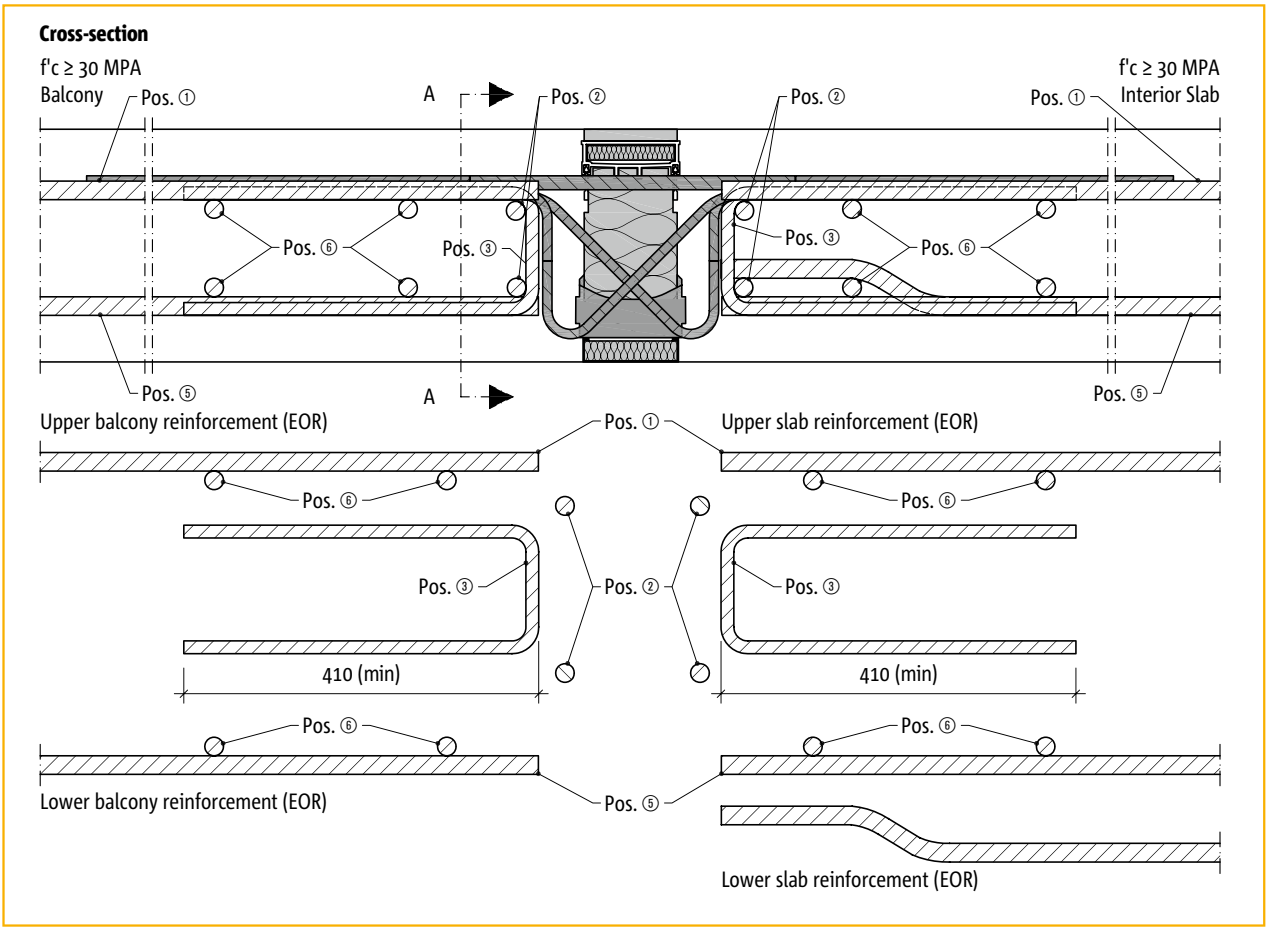


Deformation factors tan α Concrete cover CC = 40 mm	Schöck Isokorb® type			
Isokorb® height H [mm]	CM10	CM20	CM30	CM40
180	1.1	1.1	1.1	1.1
190	1.0	1.0	1.0	1.0
200	0.9	0.9	0.9	0.9
210	0.8	0.8	0.8	0.8
220	0.8	0.8	0.8	0.8
230	0.7	0.7	0.7	0.7
240	0.7	0.7	0.7	0.7
250	0.6	0.6	0.6	0.6

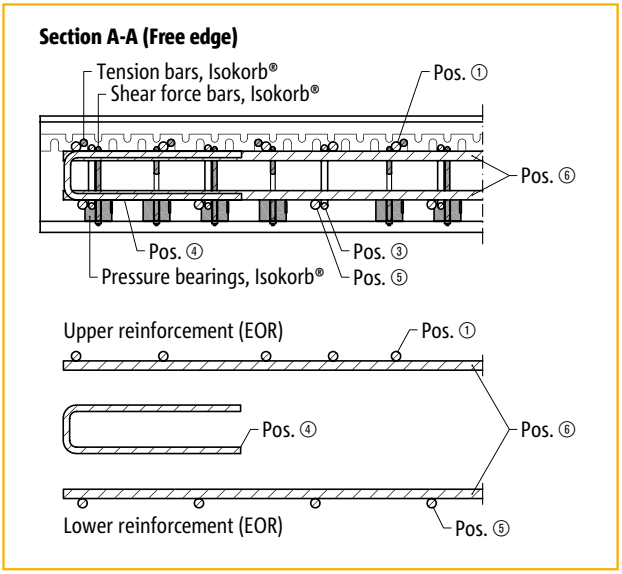
Deformation factors tan α Concrete cover CC = 55 mm	Schöck Isokorb® type			
Isokorb® height H [mm]	CM10	CM20	CM30	CM40
200	1.1	1.1	1.1	1.1
210	1.0	1.0	1.0	1.0
220	0.9	0.9	0.9	0.9
230	0.8	0.8	0.8	0.8
240	0.8	0.8	0.8	0.8
250	0.7	0.7	0.7	0.7

Schöck Isokorb® type CM
Cast-in-place reinforcement

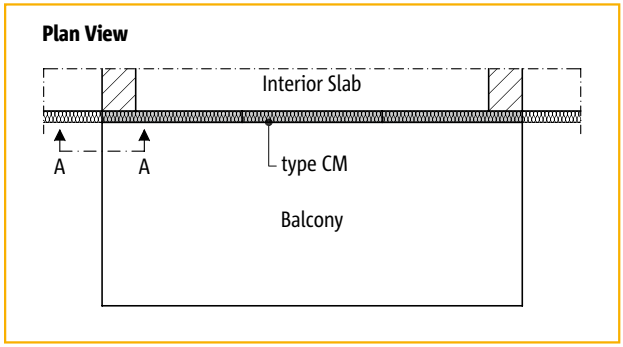
The cast-in-place reinforcement, is defined by the EOR of the building in accordance with structural requirements. The tension bars of the Schöck Isokorb® type CM must be overlapped with the tensile reinforcement (Pos. 1). Positions 2 (longitudinal edge reinforcement), 3 (U-Bars) and 4 (U-Bars for the free balcony edges) must also be provided. Following is a suggestion for the reinforcement layout.



Cross section of recommended slab reinforcement (supplied by building contractor)



Section A-A Depiction of free balcony edge



Schöck Isokorb® type CM

Cast-in-place reinforcement, indirect support

Suggestion for cast-in-place connective reinforcement for 100% design strength with minimum concrete strength of 30MPa.
The existing slab reinforcement can be taken into account for the required reinforcement of connections with Schöck Isokorb®.

Schöck Isokorb® type	CM10	CM20	CM30	CM40
Pos 1: Overlapping reinforcement				
Required cross-section area a_s [mm² / 1.0 m width]	680	910	1130	1360
Alternative 1	10M @ 140mm	10M @ 100mm	10M @ 80mm	10M @ 70mm
Alternative 2	15M @ 250mm	15M @ 200mm	15M @ 150mm	15M @ 130mm
Required lap splice length Pos.1				
Minimum [mm]	562	562	562	562
provided by Schöck Isokorb® [mm]	700	700	700	700
Pos 2: Longitudinal edge reinforcement				
Alternative 1	4 x 10M	4 x 10M	4 x 15M	4 x 15M
Alternative 2	4 x 15M	4 x 15M	4 x 15M	4 x 15M
Pos 3: U-Bars for the slab edges				
Alternative 1	10M @ 300mm	10M @ 300mm	10M @ 250mm	10M @ 200mm
Alternative 2	15M @ 350mm	15M @ 350mm	15M @ 300mm	15M @ 300mm
Pos 4: U-Bars for the free balcony edge				
Required cross-section area a_s [mm² / 1.0 m width]	In accordance with EOR specifications			
Pos 5: Reinforcement bottom layer				
Required cross-section area a_s [mm² / 1.0 m width]	In accordance with EOR specifications			
Pos 6: Longitudinal reinforcement				
Required cross-section area a_s [mm² / 1.0 m width]	In accordance with EOR specifications			

Notes:

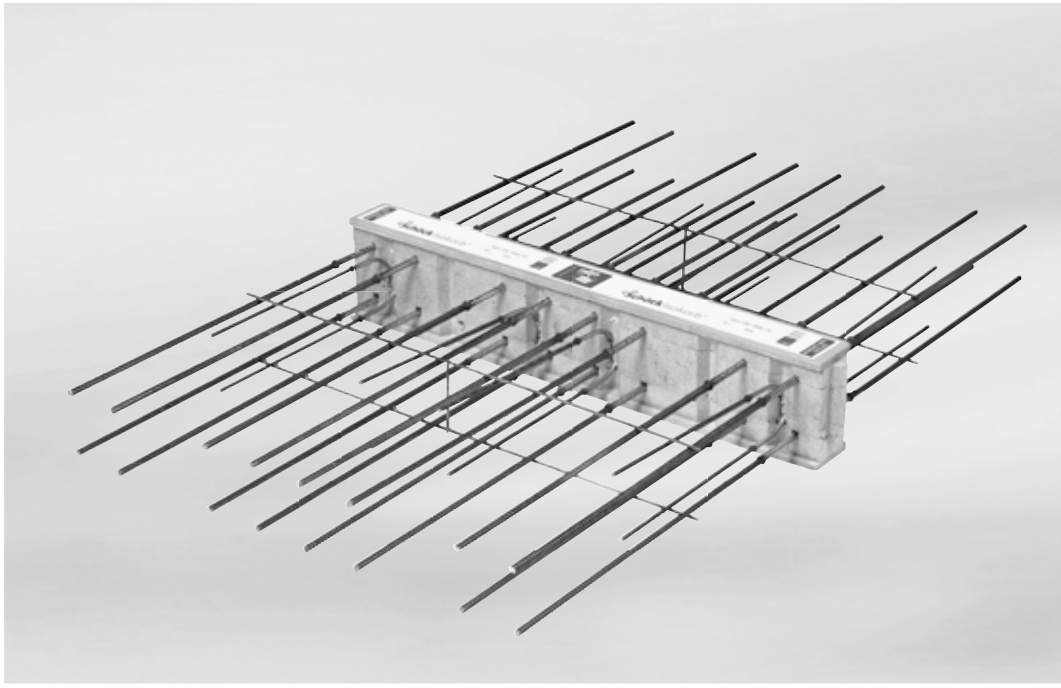
- Pos. 1 must run as close as possible to the thermal insulation at both sides of the Schöck Isokorb®, taking the required concrete cover into consideration.
- Pos. 4 should be chosen such that the U-bars can be arranged between the legs of Pos. 3.
- All free edges must be bordered using structural U-bars as per EOR specifications.
- The centerline distance of any pressure element from any free concrete edge, including expansion joints, must be at least 50 mm.
- The centerline distance of any tension or shear bar from any free concrete edge, including expansion joints, must be at least 50 mm.
- The lap splice length provided by Schöck Isokorb® = the length of the tension bar from the face of the Isokorb® to the free end - Concrete Cover (CC).

Schöck Isokorb® type CM

Checklist for Professional Engineer for signing and sealing

- ☐ Has the recommended maximum cantilever length for the selected height of the Schöck Isokorb® been taken into consideration?
- ☐ Has the system cantilever length "ℓ" used for the design?
- ☐ Have the factored member forces at the Schöck Isokorb® connection been determined at design level?
- ☐ Has the critical concrete strength been taken into consideration in the choice of design table?
- ☐ Has an appropriate concrete cover been selected and used with the calculation tables?
- ☐ Have both slabs adjacent to the Isokorb® been verified for bending and shear capacities by the EOR?
- ☐ Has the additional deformation as a result of the Schöck Isokorb® been taken into consideration in the deformation calculations of the overall structure?
- ☐ Has the required camber been specified in the design drawings? Was the drainage direction taken into consideration in the camber specification?
- ☐ Have the requirements with regard to fire protection been determined, and has the relevant suffix (-R90 or R120) been added to the Isokorb® type designation in the design drawings?
- ☐ Has the outer corners been designed using Schöck Isokorb® type CM-CC 40 and Schöck Isokorb® type CM-CC 55.
- ☐ Has the maximum permissible expansion gap spacing been taken into consideration for the specific slab configuration?
- ☐ Have the horizontal loads such as those from earthquakes been taken into consideration? Additional CEQ modules may be required.
- ☐ Has the connecting reinforcement in the balcony and interior slabs been defined by the EOR?
- ☐ When using type CM and fully prefabricated parts, has the cast-in-place strip of concrete (width ≥ 50 mm from pressure bearing elements) that is required to create the tight fit of the HTE pressure bearing been drawn into the design plans?

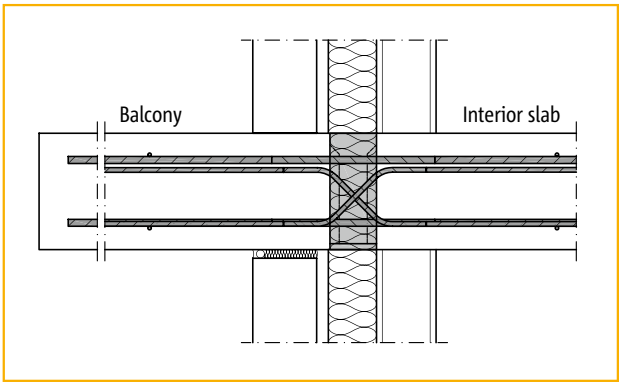
Schöck Isokorb® type CMD



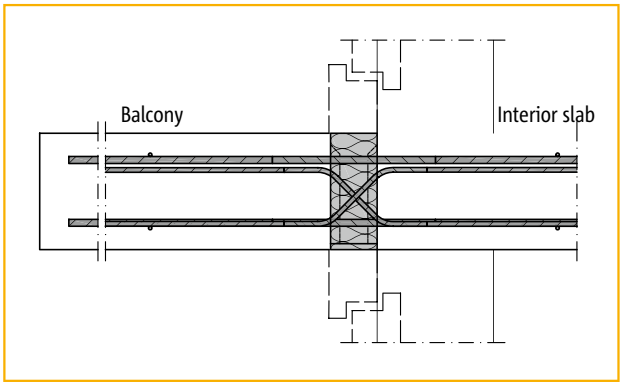
Schöck Isokorb® type CMD

The Schöck Isokorb® type CMD (concrete slab) is suitable for cantilevered balconies at continuous slabs with different span lengths. It transfers positive and negative moments (M, D double) and shear force.

Schöck Isokorb® type CMD
Section/element arrangement



Schöck Isokorb® type CMD with steel studs, facing shell and insulation layer in between



Schöck Isokorb® type CMD with window wall systems

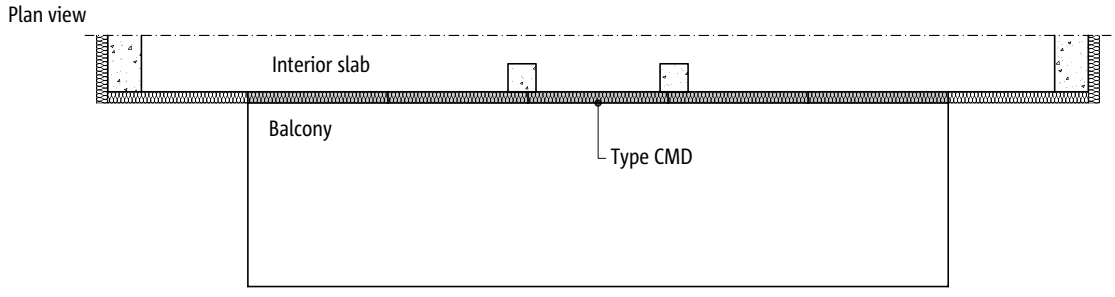
Position of Schöck Isokorb® type CMD

The Schöck Isokorb® type CMD should be located in the insulating layer.

Orientation of Schöck Isokorb® type CMD

- Attention: the Schöck Isokorb® type CMD does not have a symmetrical design.
- The upper bar is above the shear force bars, and the lower bar is in the same layer as the shear force bars.
- Pay attention to installation orientation and show as a cross-section view on the design drawings.
- The Schöck Isokorb® type CMD has the same design at the balcony side and the interior slab side.

Element arrangement



- If the Schöck Isokorb® type CMD is used with precast concrete construction, the plans must include a cast-in-place strip of concrete (width = bar length from insulating element) for reliable anchorage.

Schöck Isokorb® type CMD
Slab geometry/expansion joints

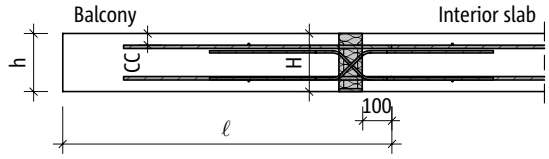
Recommended maximum cantilever length

The following maximum cantilever lengths "ℓ" are recommended in order to avoid excessive vibration behaviour in the balcony slab.

Concrete covering for tension bars	max cantilever length ℓ [m] with Isokorb® height H [mm]							
	180	190	200	210	220	230	240	250
CC = 40 mm	1.95	2.10	2.25	2.39	2.54	2.68	2.83	2.98
CC = 55 mm	–	–	–	2.17	2.32	2.46	2.61	2.76

Cantilever length for the structural calculations

The support of the balcony is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.

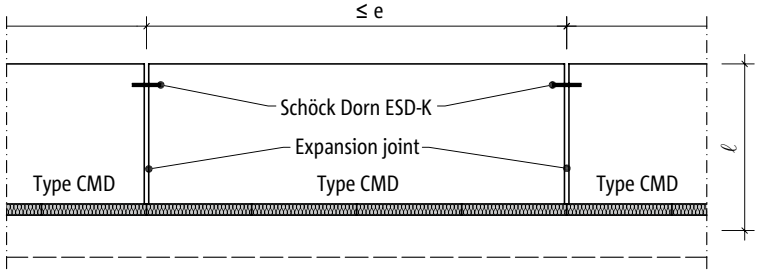


Expansion joints (recommended balcony length)

The expansion joint spacing shown below corresponds to a temperature difference of ΔT = 70 °C.

Maximum expansion joint spacing e [m]

Schöck Isokorb® type	CMD
Maximum expansion joint spacing e	11.3 m



Schöck Isokorb® type CMD maximum expansion joint spacing e

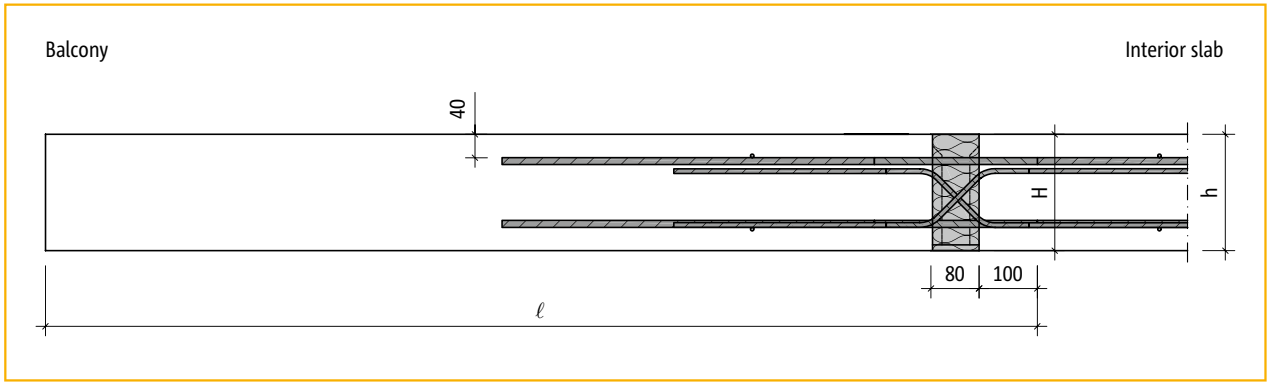
Note:

- The maximum expansion joint spacing must be verified by the EOR.
- The expansion joint must be free to deform in the longitudinal direction. Schöck Dorn ESD-K in stainless steel A4 would be suitable.

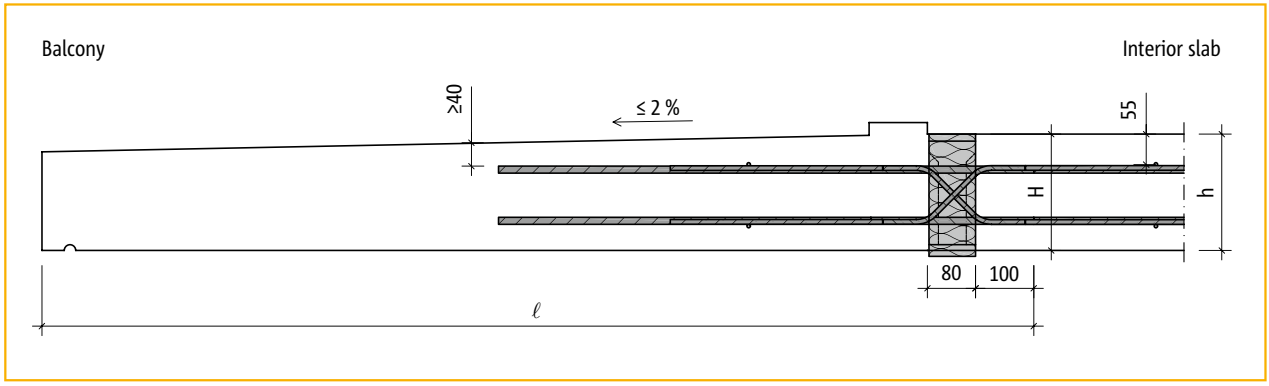
Schöck Isokorb® type CMD
Concrete cover/type designation

Concrete cover

The concrete cover of the Schöck Isokorb® type CMD is set to 40 mm (CC40) or 55 mm (CC55) from below and above. We recommend choosing the CC55 concrete covering for balcony slabs with a tilted surface. This allows the surface of the balcony slab to be inclined by 2%.



Concrete cover CC with level balcony slab



Concrete cover CC with sloped balcony slab

Type designation in design drawings

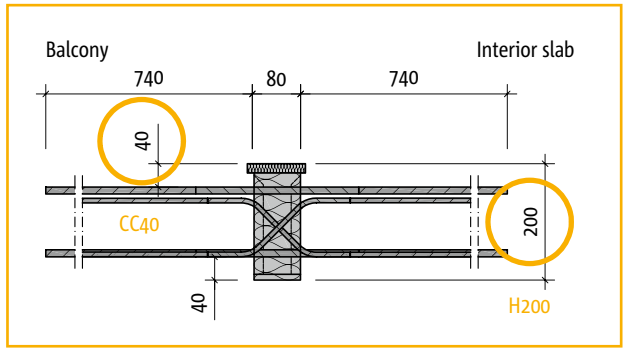
The following type designation specifies the Schöck Isokorb® type that is required.
The type designation is indicated on the design drawings.
The type designation is printed on the sticker of the Schöck Isokorb® type as a recognition feature.

		Schöck Isokorb® type		
Concrete Strength ≥ 30MPa				
Concrete cover CC = 40 mm	Isokorb® height H [mm]	CMD10	CMD20	CM
Ultimate (factored) moment resistance M_d [kNm/m]	180	19.4	25.8	3
	190	21.6	28.8	3
	200	23.8	31.7	3
	210	26.0	34.7	4
	220	28.2	37.6	4
	230	30.4	40.5	5
	240	32.6	43.5	5

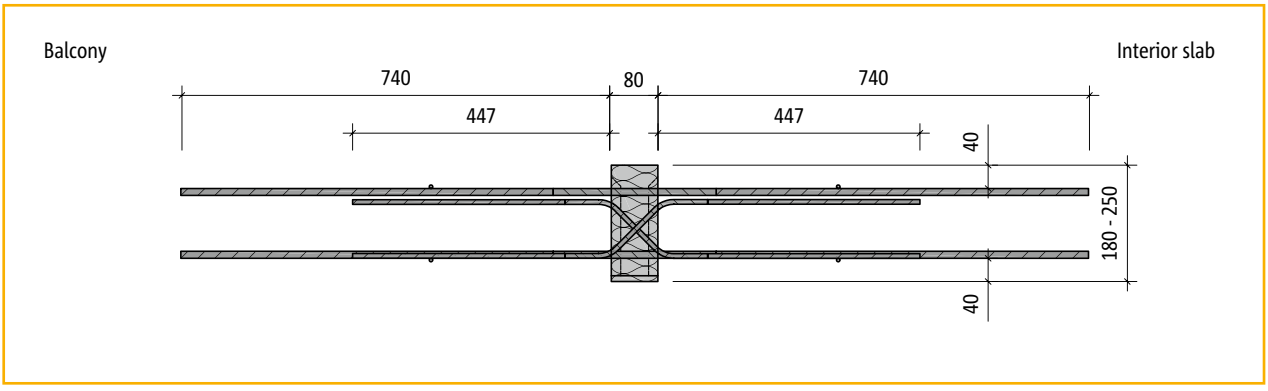
Type designation in design drawings

With fire protection **CMD20-CC40-H200-R90**

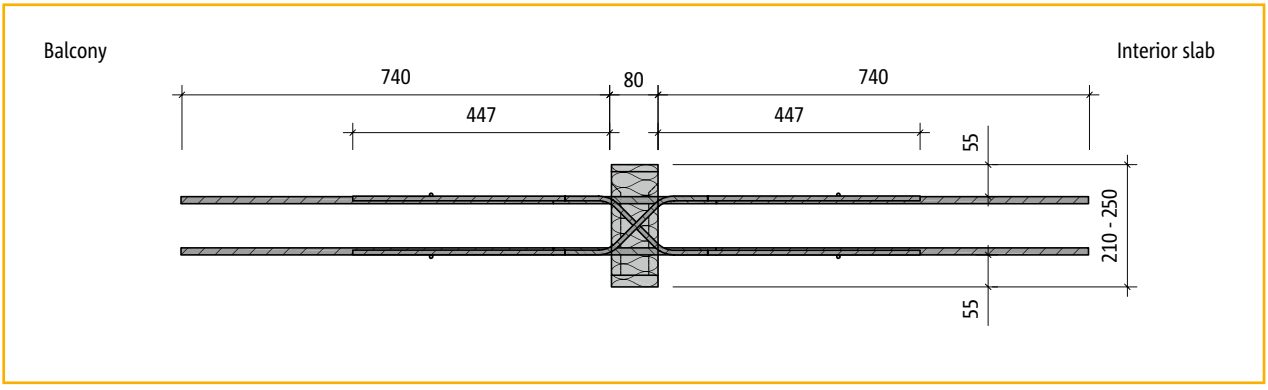
- Type/load capacity
- Concrete cover
- Isokorb® height
- Fire protection



Schöck Isokorb® type CMD
Product cross-section



Product cross-section for Schöck Isokorb® type CMD10 to CMD40, concrete cover CC40



Product cross-section for Schöck Isokorb® type CMD10 to CMD40, concrete cover CC50

Schöck Isokorb® length and configuration

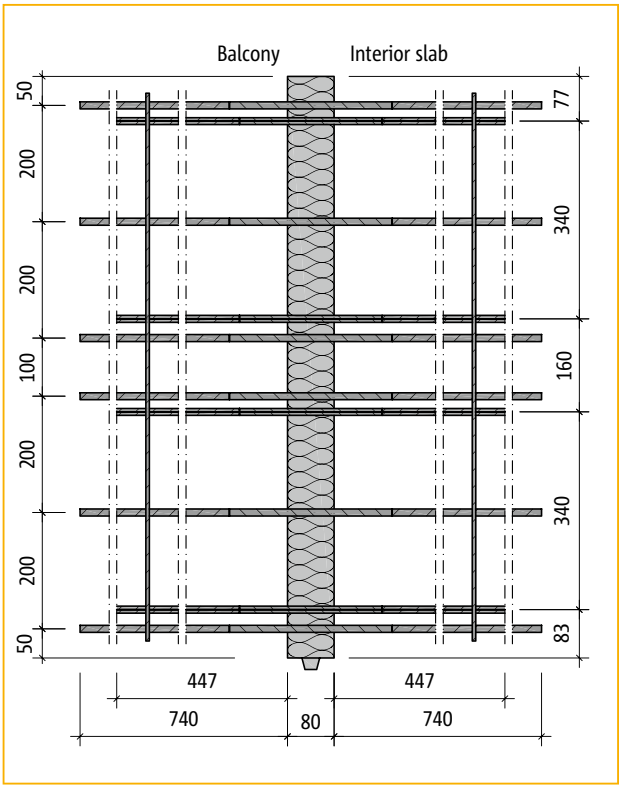
Schöck Isokorb® type	CMD10	CMD20	CMD30	CMD40
Isokorb® length [m]	1.0	1.0	1.0	1.0
Tension/compression bars	2 x 6 ø 12	2 x 8 ø 12	2 x 10 ø 12	2 x 12 ø 12
Shear force bars	4 ø 8+4 ø 8	4 ø 8+4 ø 8	4 ø 8 + 4 ø 8	4 ø 8 + 4 ø 8

Note:

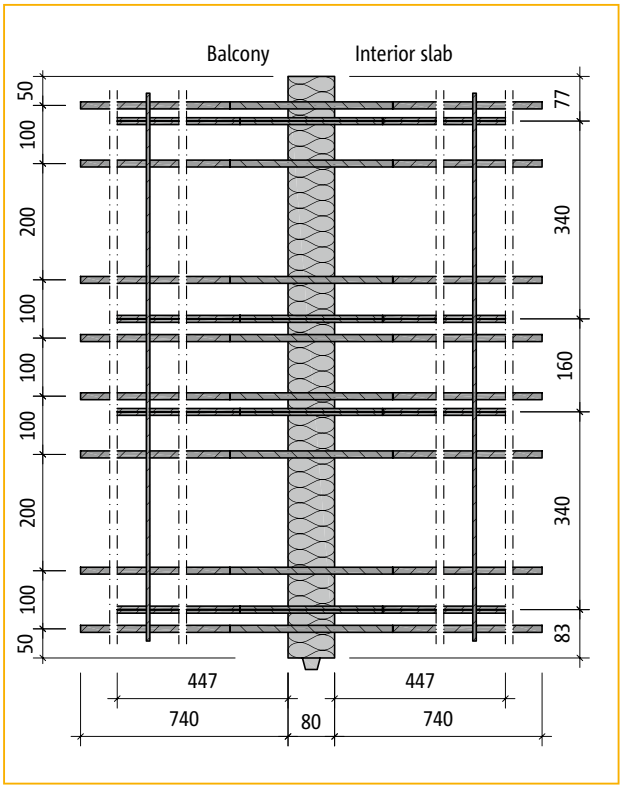
- The product cross-sections of the 4 load capacities (CMD10, CMD20,CMD30,CMD40) of the Schöck Isokorb® type CM are identical for the respective concrete cover. The load capacities of the Schöck Isokorb® type CMD vary in the number of tenscion bars amd shear force bars.
- The spacer bar, see the following page at the overhead view of the products, is used for structural position anchoring and may only be removed at the construction site after inserting the Schöck Isokorb®.
- The Schöck Isokorb® type CMD may be split at the non-reinforced locations. The spacing of the pressure elements from the free edge of the reinforced concrete slab must be at least 50 mm, and the axis spacing of the shear force bars must be at least 100 mm and no more than 150 mm.

Schöck Isokorb® type CMD

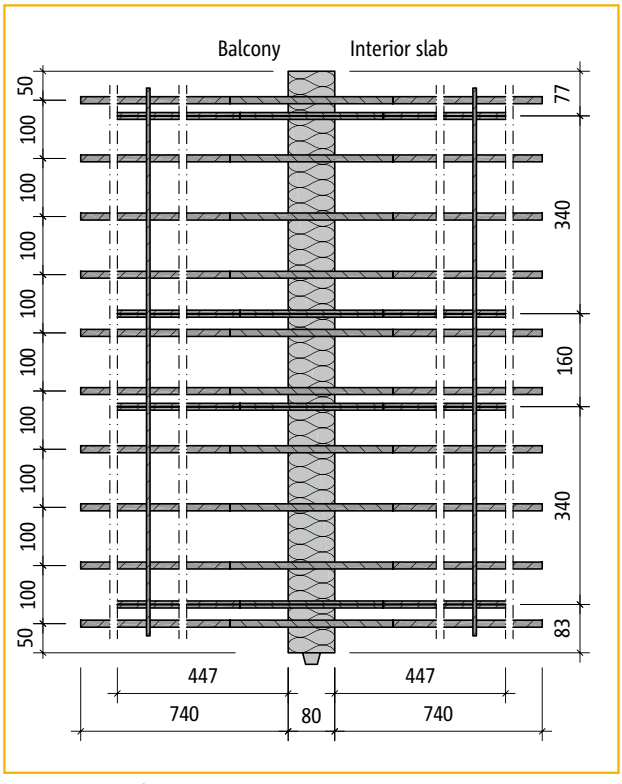
Overhead view of product



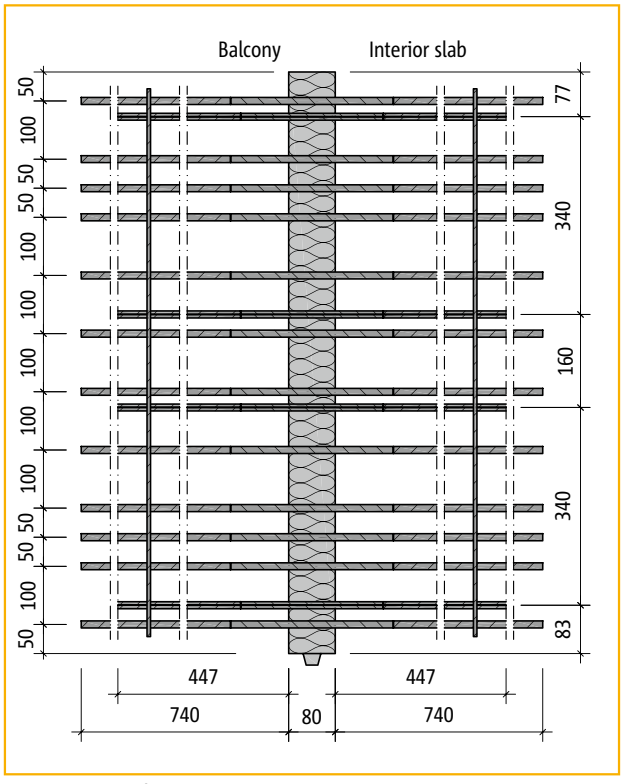
Overhead view of Schöck Isokorb® type CMD10 product



Overhead view of Schöck Isokorb® type CMD20 product



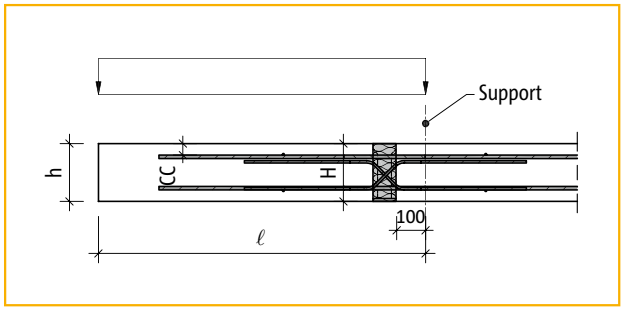
Overhead view of Schöck Isokorb® type CMD30 product



Overhead view of Schöck Isokorb® type CMD40 product

Schöck Isokorb® type CMD
Design

The support is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Product Selection Table as per CSA S23.3-04 for non-seismic load case

Concrete Strength ≥ 30MPa		Schöck Isokorb® type			
Concrete cover CC = 40 mm	Isokorb® height H [mm]	CMD10	CMD20	CMD30	CMD40
Ultimate (factored) moment resistance M_r[kNm/m]	180	19.4	25.8	32.3	38.8
	190	21.6	28.8	36.0	43.2
	200	23.8	31.7	39.6	47.6
	210	26.0	34.7	43.3	52.0
	220	28.2	37.6	47.0	56.4
	230	30.4	40.5	50.7	60.8
	240	32.6	43.5	54.3	65.2
	250	34.8	46.4	58.0	69.6
Ultimate (factored) shear resistance V_r [kNm]	180-250	48.3	48.3	48.3	48.3

Product Selection Table as per CSA S23.3-04 for non seismic load case

Concrete Strength ≥ 30MPa		Schöck Isokorb® type			
Concrete cover CC = 55 mm	Isokorb® height H [mm]	CMD10	CMD20	CMD30	CMD40
Ultimate (factored) moment resistance M_r[kNm/m]	210	19.4	25.8	32.3	38.8
	220	21.6	28.8	36.0	43.2
	230	23.8	31.7	39.6	47.6
	240	26.0	34.7	43.3	52.0
	250	28.2	37.6	47.0	56.4
Ultimate (factored) shear resistance V_r [kN/m]	210-250	48.3	48.3	48.3	48.3

Notes

- With different balcony slab, the weaker and floor slab concrete should be used with the tables above.
- The EOR must confirm strength of the slabs attached at both sides of the Schöck Isokorb®.
- The shear capacity of the slabs must be verified by the EOR.
- For seismic load case please contact Schöck technical support.
- The capacities are considering a maximum permitted bar separation according CSA A23.3-04 Cl 12.14.2.3. This has to be taken into account by the EOR.

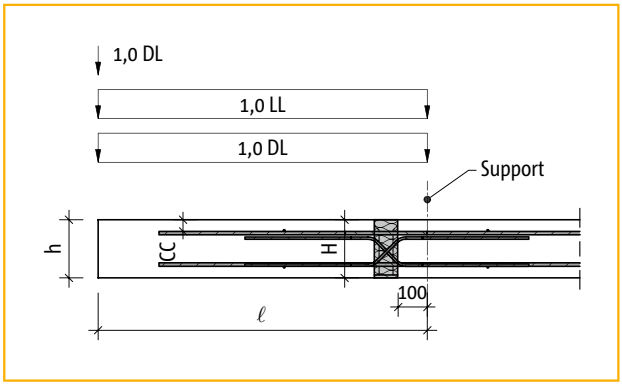
Schöck Isokorb® type CMD
Deformation/camber

The deformation values in the table (tan α [%]) result from the deformation of the Schöck Isokorb® under service loads. They are used to estimate the required camber. The mathematical camber of the balcony slab formwork results from the deflection as per CSA A23.3-04 plus the deformation w_2 from the Schöck Isokorb®. The camber of the balcony slab formwork to be specified by the EOR in the design drawings (e.g., calculated overall deformation from balcony slab w_1 + interior slab angle of rotation + Schöck Isokorb® w_2) should be rounded such that the planned drainage direction is achieved (e.g. round up for drainage towards building façade, round down for drainage towards end of cantilever slab). The given equation and tan α values are for the service load case (1.0DL + 1.0LL). The designing engineer should also consider additional long term deflections as per CSA A23.3-04.

Deformation (w_2) as a result of Schöck Isokorb®

$$w_2\,[\text{mm}] = \tan\alpha \times \ell \times \frac{M_n}{\frac{M_r}{1.4}} \times \frac{1}{100}$$

tan α = Insert value from table (see page 30)
ℓ = Cantilever length [mm]
M_n = Nominal (unfactored) moment resistance [kNm/m]
The load combination to be used here is defined by the EOR.
M_r = Ultimate (factored) moment resistance [kNm/m] of the Schöck Isokorb® type CMD (see page 66).

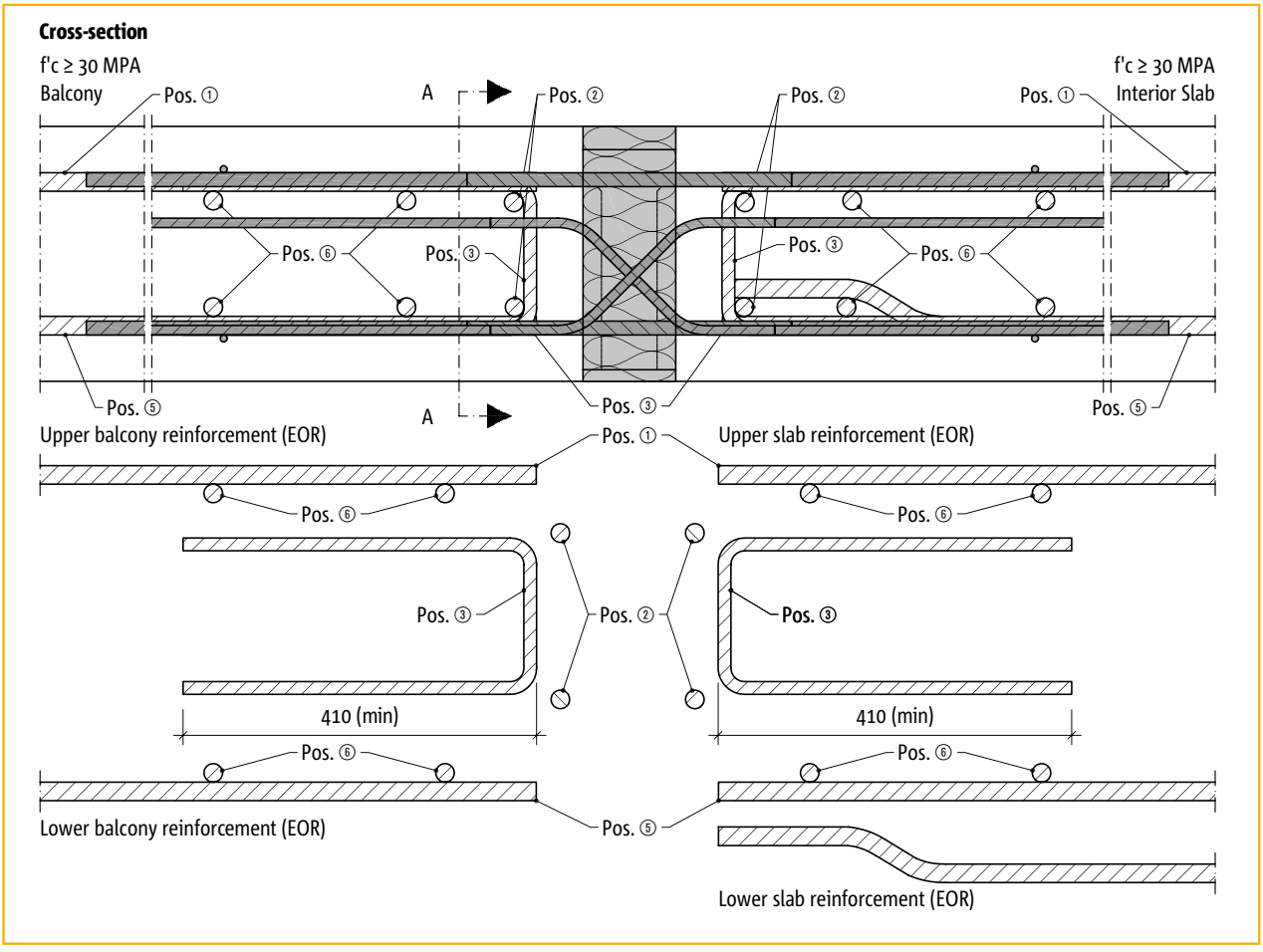


Deformation factors tan α Concrete cover CC = 40 mm	Schöck Isokorb® type			
Isokorb® height H [mm]	CMD10	CMD20	CMD30	CMD40
180	1.1	1.1	1.1	1.1
190	1.0	1.0	1.0	1.0
200	0.9	0.9	0.9	0.9
210	0.8	0.8	0.8	0.8
220	0.8	0.8	0.8	0.8
230	0.7	0.7	0.7	0.7
240	0.7	0.7	0.7	0.7
250	0.6	0.6	0.6	0.6

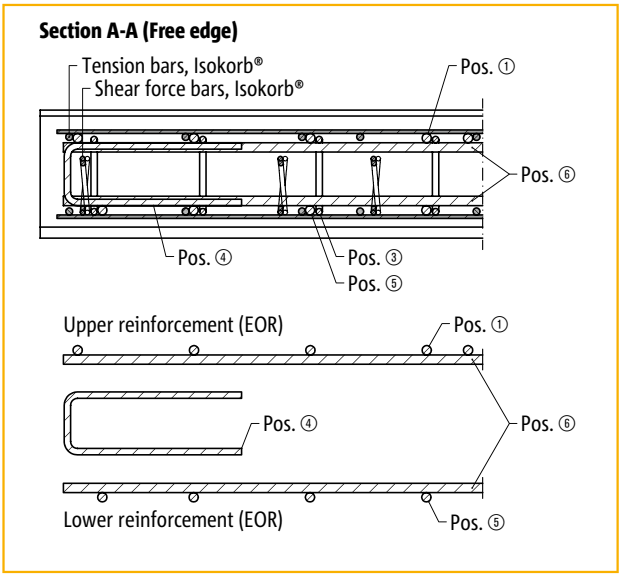
Deformation factors tan α Concrete cover CC = 55 mm	Schöck Isokorb® type			
Isokorb® height H [mm]	CMD10	CMD20	CMD30	CMD40
210	1.1	1.1	1.1	1.1
220	1.0	1.0	1.0	1.0
230	0.9	0.9	0.9	0.9
240	0.8	0.8	0.8	0.8
250	0.8	0.8	0.8	0.8

Schöck Isokorb® type CMD
Cast-in-place reinforcement

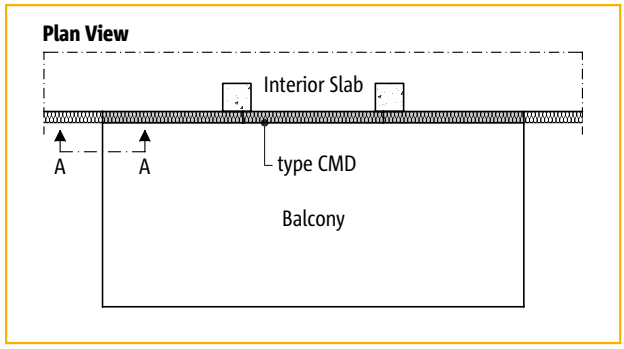
The cast-in-place reinforcement is defined by the EOR in accordance with structural requirements. The tension bars of the Schöck Isokorb® type CM must be overlapped with the tensile reinforcement (Pos. 1). Positions 2 (Longitudinal edge Reinforcement), 3 (U-Bars) and 4 (U-bars for the free balcony edge) must also be provided. The following is a suggestion for the reinforcement.



Cross section of recommended cast-in-place reinforcement (supplied by building contractor)



Section A-A Depiction of free balcony edge



Schöck Isokorb® type CMD

Cast-in-place reinforcement, indirect support

Suggestion for cast-in-place connective reinforcement

For 100% section strength with minimum concrete strength of 30 MPa. The existing slab reinforcement can be taken into account for the required reinforcement of connections with Schöck Isokorb®.

Schöck Isokorb® type	CMD10	CMD20	CMD30	CMD40
Pos 1: Overlapping reinforcement				
Required cross-section area a_s [mm²/1.0 m width]	680	910	1130	1360
Alternative 1	10M @ 140mm	10M @ 100mm	10M @ 80mm	10M @ 70mm
Alternative 2	15M @ 250mm	15M @ 200mm	15M @ 150mm	15M @ 130mm
Required lap splice length Pos.1				
Minimum [mm]	562	562	562	562
provided by Schöck Isokorb® [mm]	700	700	700	700
Pos 2: Longitudinal edge Reinforcement				
Alternative 1	4 x 10M	4 x 10M	4 x 10M	4 x 10M
Alternative 2	4 x 15M	4 x 15M	4 x 15M	4 x 15M
Pos 3: U-Bars for the slab edges				
Alternative 1	10M @ 250mm	10M @ 250mm	10M @ 250mm	10M @ 250mm
Alternative 2	15M @ 350mm	15M @ 350mm	15M @ 350mm	15M @ 350mm
Pos 4: U-Bars for the free balcony edge				
Required cross-section area a_s [mm²/1.0 m width]	In accordance with EOR specifications			
Pos 5: Reinforcement bottom layer				
Required cross-section area as [mm²/1.0 m width]	In accordance with EOR specifications			
Pos 6: Longitudinal reinforcement				
Required cross-section area as [mm²/1.0 m width]	In accordance with EOR specifications			

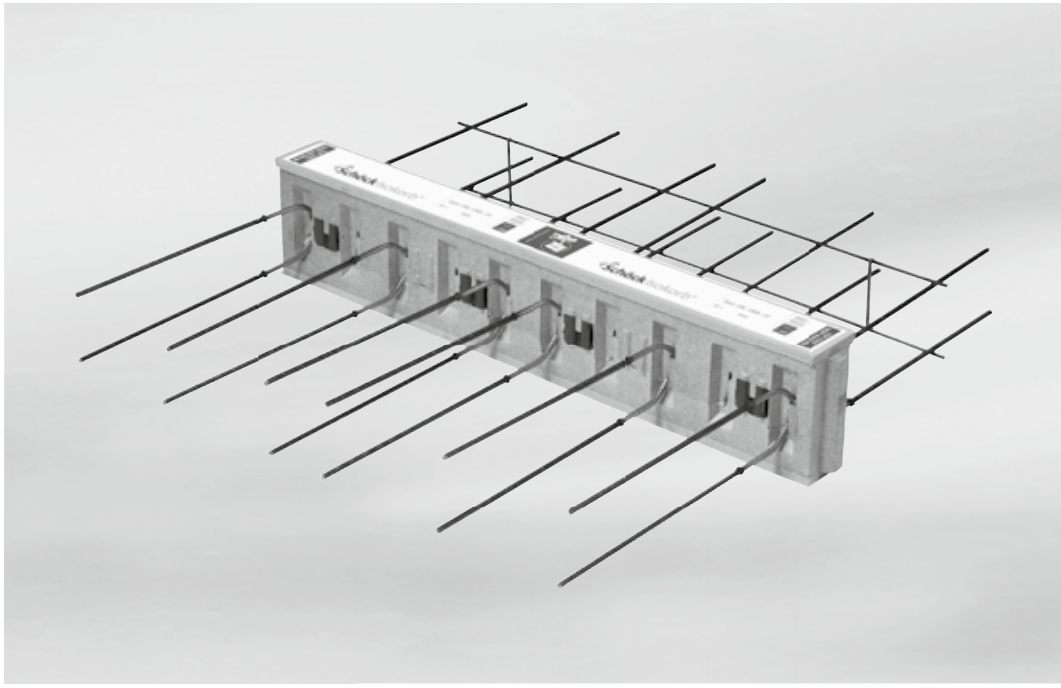
Notes:

- Pos. 1 must run as close as possible to the thermal insulation at both sides of the Schöck Isokorb®, taking the required concrete cover into consideration.
- Pos. 4 should be chosen such that the U-bars can be arranged between the legs of Pos. 3.
- All free edges must be bordered using structural U-bars as per EOR specifications.
- The spacing of the tension/pressure bars from the free edge or the expansion gap must be at least 50 mm.
- The centerline distance of any pressure element from any free concrete edge, including expansion joints, must be at least 50 mm.
- The centerline distance of any tension or shear bar from any free concrete edge, including expansion joints, must be at least 50 mm.
- The lap splice length provided by Schöck Isokorb® = the length of the tension bar from the face of the Isokorb® to the free end - Concrete Cover (CC).

Schöck Isokorb® Type CMD
Checklist

- ☐ Has the recommended maximum cantilever length for the selcted height of the Schöck Isokorb® been taken into consideration?
- ☐ Has the system cantilever length (i.e., "ℓ") been used for the design?
- ☐ Have the factored member forces at the Schöck Isokorb® connection been determined at design level?
- ☐ Has the critical concrete strength been taken into consideration in the choice of design table?
- ☐ Has an appropriate concrete cover been selected and used with the calculation tables?
- ☐ Have both slabs adjacent to the Isokorb® been verified for bending and shear capacities by the EOR?
- ☐ Has the additional deformation as a result of the Schöck Isokorb® been taken into consideration in the deformation calculations of the overall structure?
- ☐ Has the required camber been specified in the design drawings? Was the drainage direction taken into consideration in the camber specification?
- ☐ Have the requirements with regard to fire protection been determined, and has the relevant suffix (-R90 or R120) been added to the Isokorb® type designation in the design drawings?
- ☐ Has the maximum permissible expansion gap spacing been taken into consideration for the specific slab configuration?
- ☐ Has the connecting reinforcement in the balcony and interior slabs been defined by the EOR?
- ☐ Has the cast-in-place strip of concrete that is needed for reliable anchorage (width = bar length starting at insulating element) been included in the design drawings for the type CMD in the case of precast building construction?

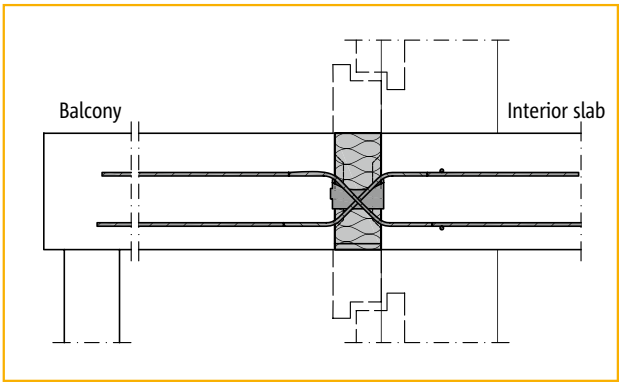
Schöck Isokorb® type CV



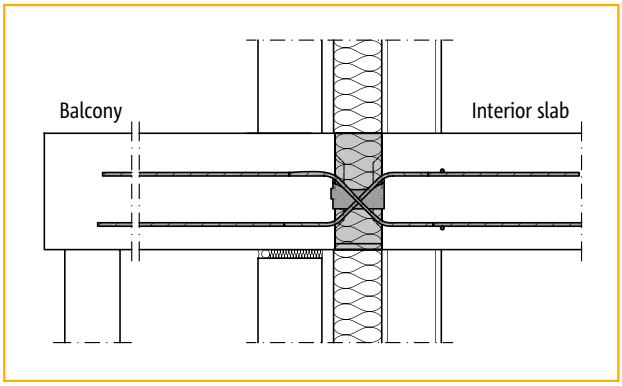
Schöck Isokorb® type CV

The Schöck Isokorb® type CV is suitable for supported reinforced concrete slabs. (C concrete slab)
It transmits positive shear force (vertical shear).

Schöck Isokorb® type CV
Section/element arrangement



Schöck Isokorb® type CV, supported balcony with window wall systems



Schöck Isokorb® type CV, supported balcony, steel studs, facing shell and insulation layer in between

Position of Schöck Isokorb® type CV

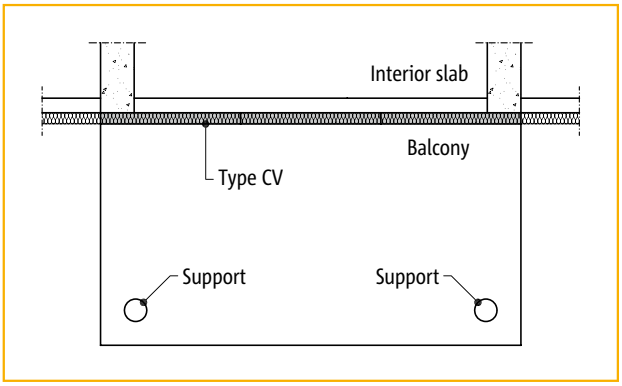
The Schöck Isokorb® type CV should be located in the insulating layer.

Orientation of the Schöck Isokorb® type CV

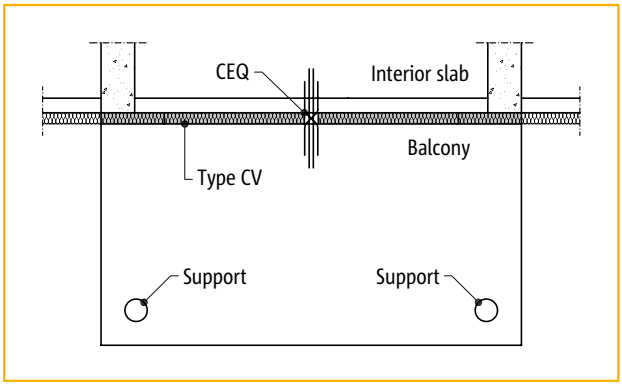
Attention: the Schöck Isokorb® type CV does not have a symmetrical design.

- The lower distance between the shear force bars and the insulating element at the bottom edge is always 40 mm. The upper distance can vary.
- Pay attention to installation orientation and show a cross-section view on the design drawings.
- The Schöck Isokorb® type CV has the same design at the balcony side and the interior slab side.

Element arrangement



Schöck Isokorb® type CV, balcony supported without planned horizontal load or earthquake load.



Schöck Isokorb® type CV, balcony supported with planned horizontal load or earthquake load.

Note:

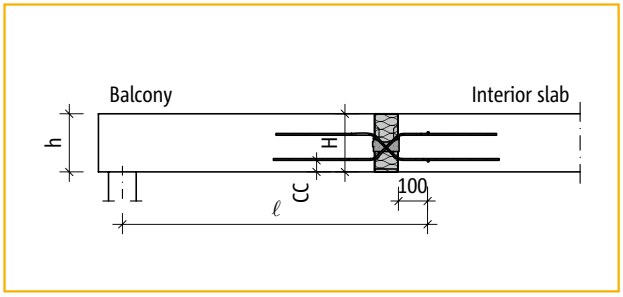
- For designed horizontal loads and earthquake loads, the Schöck Isokorb® CEQ module must be used. With horizontal tensile forces at right angles to the outside wall greater than the existing shear force, the Schöck Isokorb® CEQ module must also be used.

Schöck Isokorb® type CV
Slab geometry/span length/expansion joints

Recommended maximum span length
The maximum span length results from the factored shear force V_f.

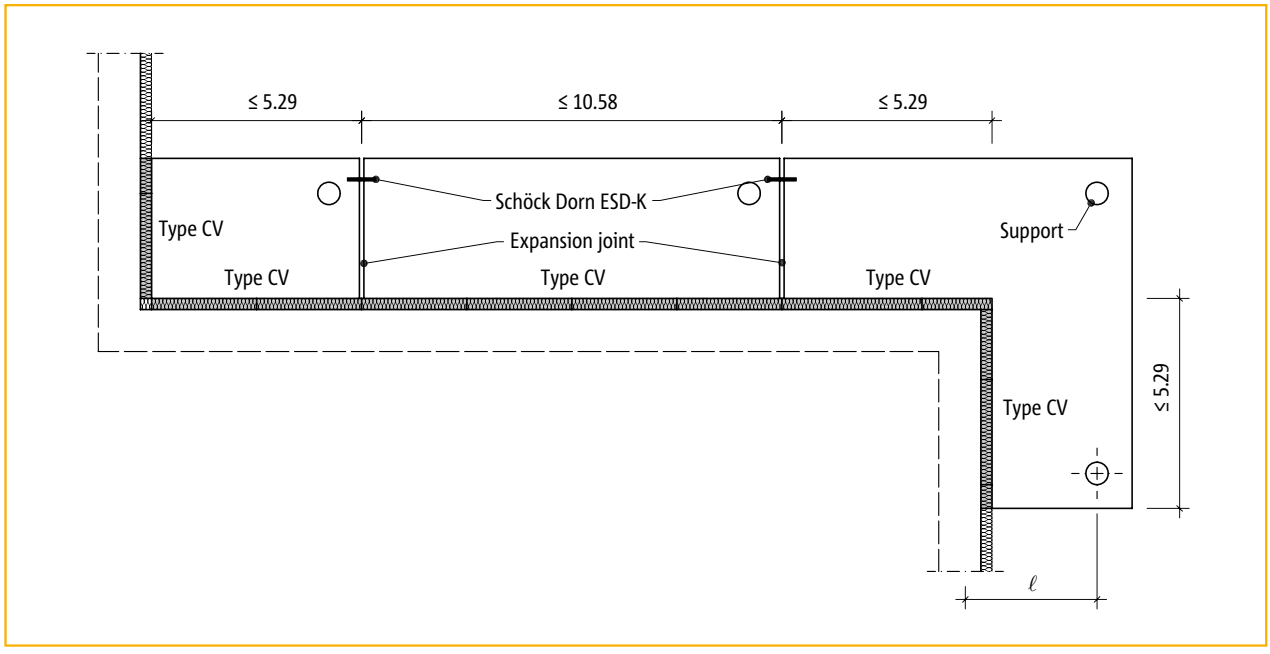
Span length for the structural calculations

The support of the balcony is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Expansion joints (recommended balcony length)

The expansion joint spacing shown below corresponds to a temperature difference of ΔT = 70 °C.



Schöck Isokorb® type CV, expansion joint arrangement

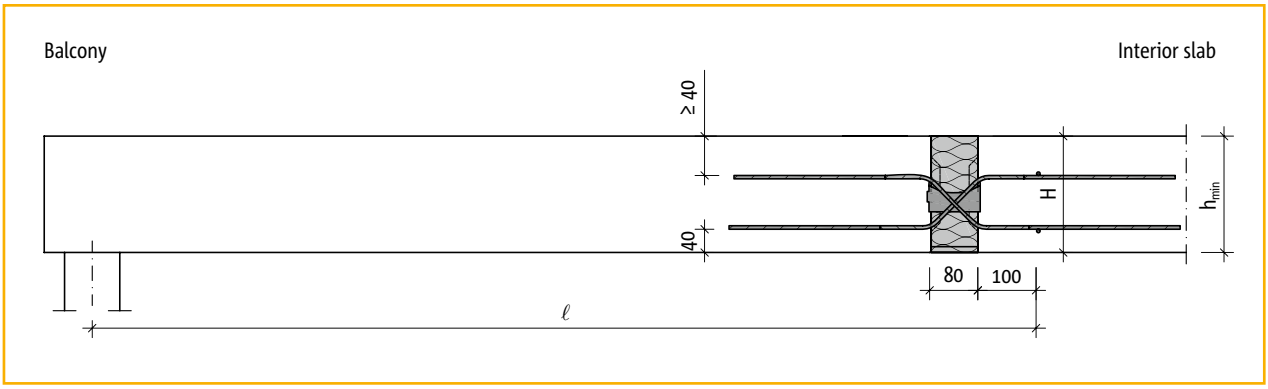
Note:

- The maximum expansion joint spacing must be verified by the EOR.
- The spacing of the pressure elements from the free edge of the expansion joint must be at least 50 mm, and the spacing of the shear force bars must be at least 100 mm and no more than 150 mm.
- The expansion joint must be free to deform in the longitudinal direction, for which we recommend the A4 stainless steel Schöck Dorn ESD-K, for example.

Schöck Isokorb® type CV
Concrete cover/type designation

Concrete cover CC

The concrete cover of the Schöck Isokorb® type CV is set to 40 mm (CC40) from below. The concrete cover is always greater than 40 mm if the minimum slab thickness is complied with.



Concrete cover without sloping balcony slab

Minimum slab thickness

The following minimum slab thicknesses h_{min} must be complied with depending on the load capacity.

Schöck Isokorb® type	CV10	CV20	CV30
Minimum slab height h_{min} [mm]	180	180	180

Type designation in design drawings

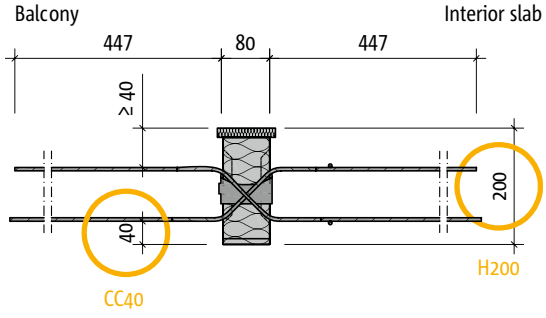
The following type designation specifies the Schöck Isokorb® type that is required.
The type designation is indicated on design drawings.
The type designation is printed on the sticker of the Schöck Isokorb® type as a recognition feature.

Schöck Isokorb® type		CV10	CV20
Ultimate (factored) shear resistance, V_r [kN/m]	Concrete covering CC40 [mm]	Concrete strength :	
Isokorb® height H [mm]	180-210	40.8	54.4
	220	38.4	51.2
	230	33.3	44.4
	240	29.4	39.2
	250	26.3	35.1
Slab thickness h_{min} [mm]		180	180

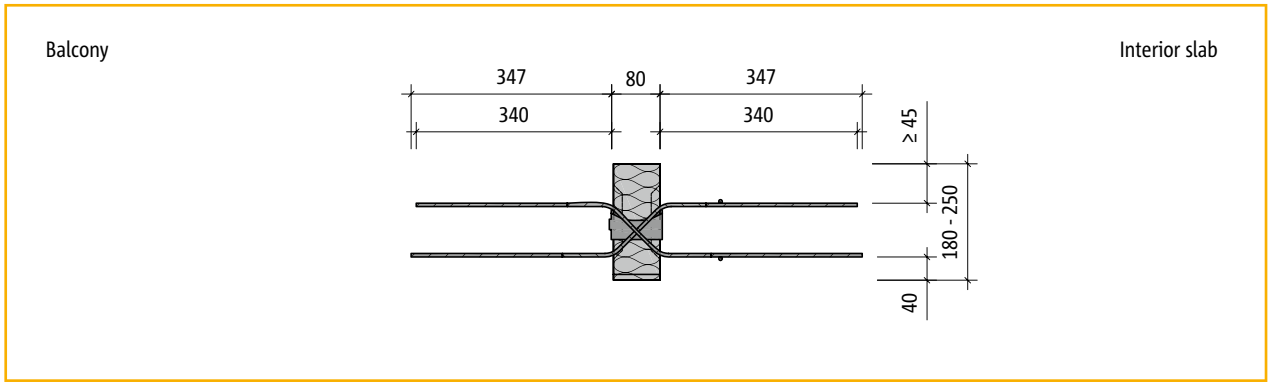
Type designation in design drawings

with fire protection **CV20-CC40-H200-R120**

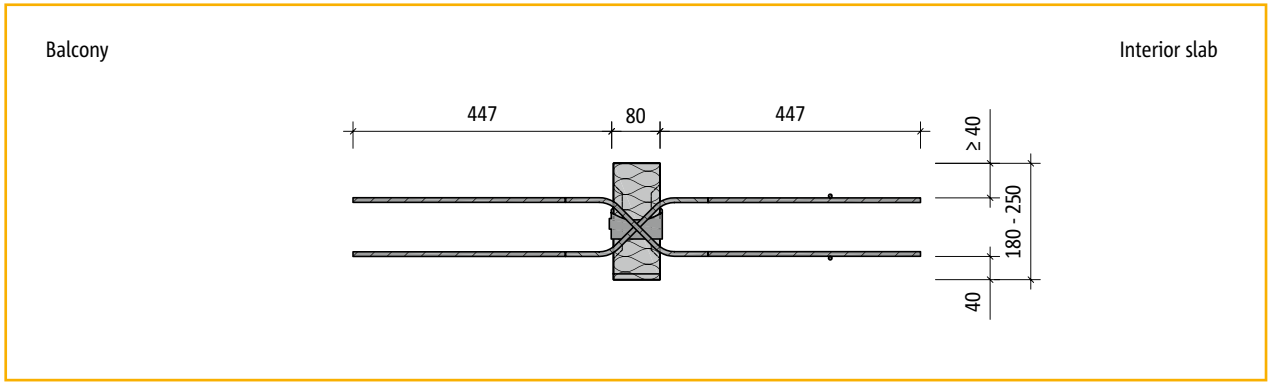
Type/load capacity
Concrete cover
Isokorb® height
Fire protection



Schöck Isokorb® type CV
Product cross-section



Product cross-section of Schöck Isokorb® type CV10 and CV20



Product cross-section of Schöck Isokorb® type CV30

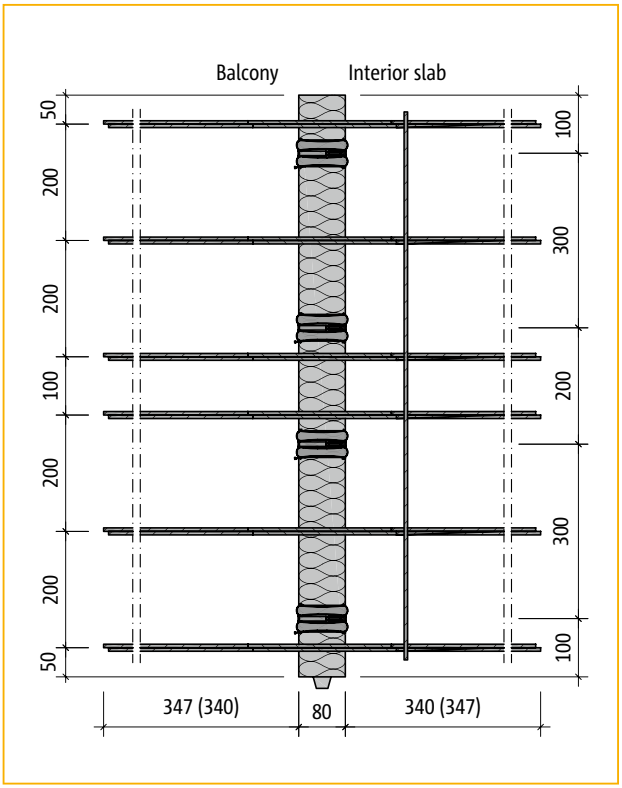
Schöck Isokorb® length and configuration

Schöck Isokorb® type	CV10	CV20	CV30
Isokorb® length [m]	1.0	1.0	1.0
Isokorb® height [mm]	180 - 250	180 - 250	180 -250
Shear force bars	6 ø 6+6 ø 6	8 ø 6 + 8 ø 6	6 ø 8+6 ø 8
Pressure bearings (pcs.)	4	4	4

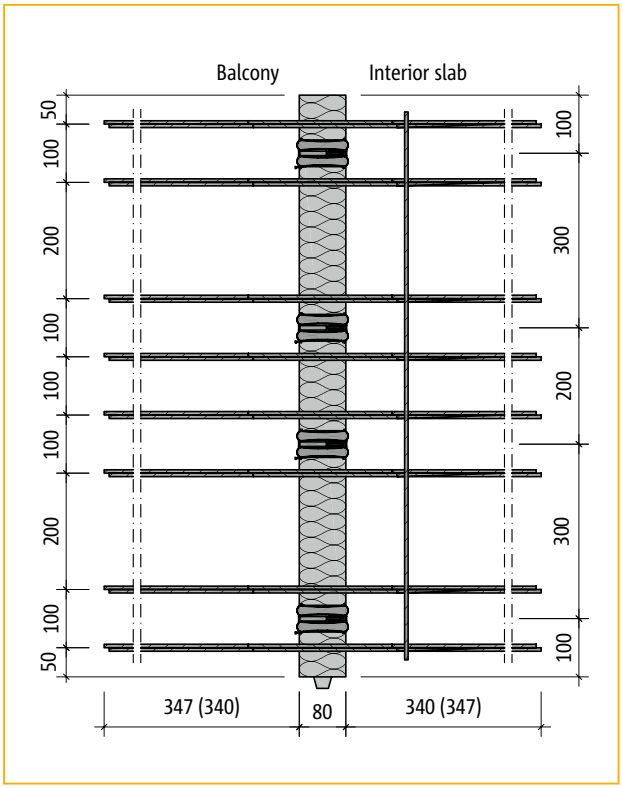
Note:

- The product cross-sections of load capacities CV10 and CV20 of the Schöck Isokorb® type CV are identical.
- The Schöck Isokorb® type CV may be split at the non-reinforced locations. The spacing of the pressure elements from the free edge of the reinforced concrete slab must be at least 50 mm, and the spacing of the shear force bars must be at least 100 mm and no more than 150 mm.

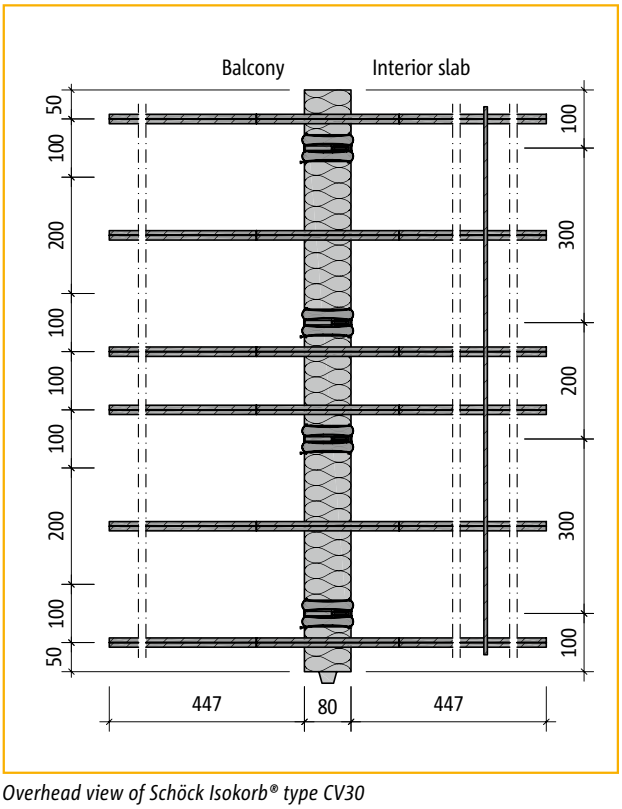
Schöck Isokorb® type CV
Overhead view of product



Overhead view of Schöck Isokorb® type CV10



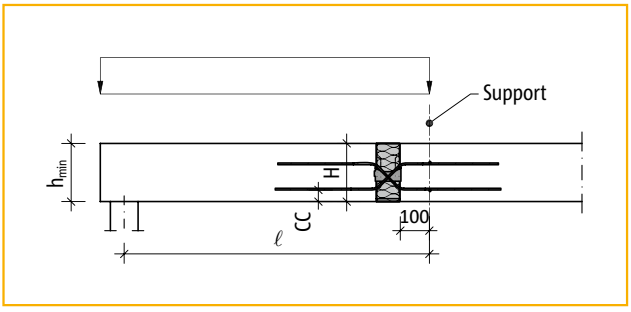
Overhead view of Schöck Isokorb® type CV20



Overhead view of Schöck Isokorb® type CV30

Schöck Isokorb® type CV
Design

The support is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Product selection table as per CSA A23.3-04

Schöck Isokorb® type		CV10	CV20	CV30
Ultimate (factored) shear resistance, V_r [kN/m]	Concrete covering CC40 [mm]	Concrete strength ≥ 30 MPa		
Isokorb® height H [mm]	180-210	40.8	54.4	72.5
	220	38.4	51.2	72.5
	230	33.3	44.4	72.5
	240	29.4	39.2	69.2
	250	26.3	35.1	61.9
Slab thickness h_{min} [mm]		180	180	180

Notes

- With different balcony slab and floor slab concrete qualities, the weaker concrete should be used with the tables above.
- The shear capacity of the slabs must be verified by the EOR.
- Because of the eccentric connection, a moment occurs at the slab edges at both sides of the Schöck Isokorb® type CV. The transmission of this moment in the two connecting slabs must be verified in each individual case.
- Verification for the slabs attached at both sides of the Schöck Isokorb® must be submitted by the EOR. When the reinforcement of the floor slab and the balcony slab which connect to the Schöck Isokorb® type CV is being determined, it must be assumed that there is a hinge, since the Schöck Isokorb® type CV can only transmit shear force.
- For seismic loads the Schöck Isokorb® CM has to be combined with the Schöck Isokorb® type CEQ.
- The capacities are considering the maximum permitted bar separation according CSA A23.3-04 Cl 12.14.2.3, based on the same height of the slab and Isokorb® and a concrete cover of the interior slab of 20mm. For differing boundary conditions the capacities have to be checked.

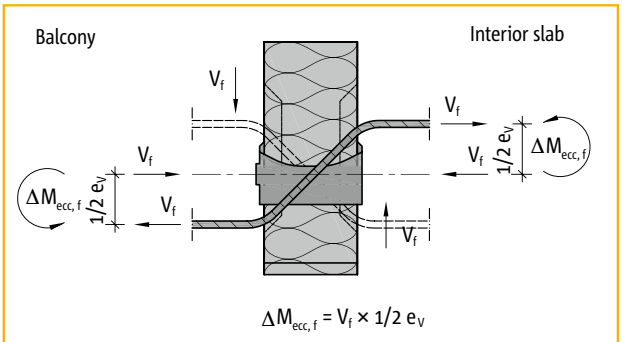
Schöck Isokorb® type CV
Moments from eccentric connection

Deformation

An estimate of the additional deformation from the Schöck Isokorb® type CV was made on the basis of component testing. In the tests, the bearing points or bearing edges were subjected to vertical deformation of approx. 0.8 to 1.0 mm.

Moments from eccentric connection

In order to determine the connecting reinforcement at both sides of the Schöck Isokorb® type CV, moments from an eccentric connection must also be taken into consideration. Each of these moments must be overlaid with the moments from the planned load, providing that they act in the same direction.



Schöck Isokorb® length and configuration

Schöck Isokorb® type	CV10	CV20	CV30
$\Delta M_{ecc,f}$ [1] [kNm/m]	1.8	2.4	3.4

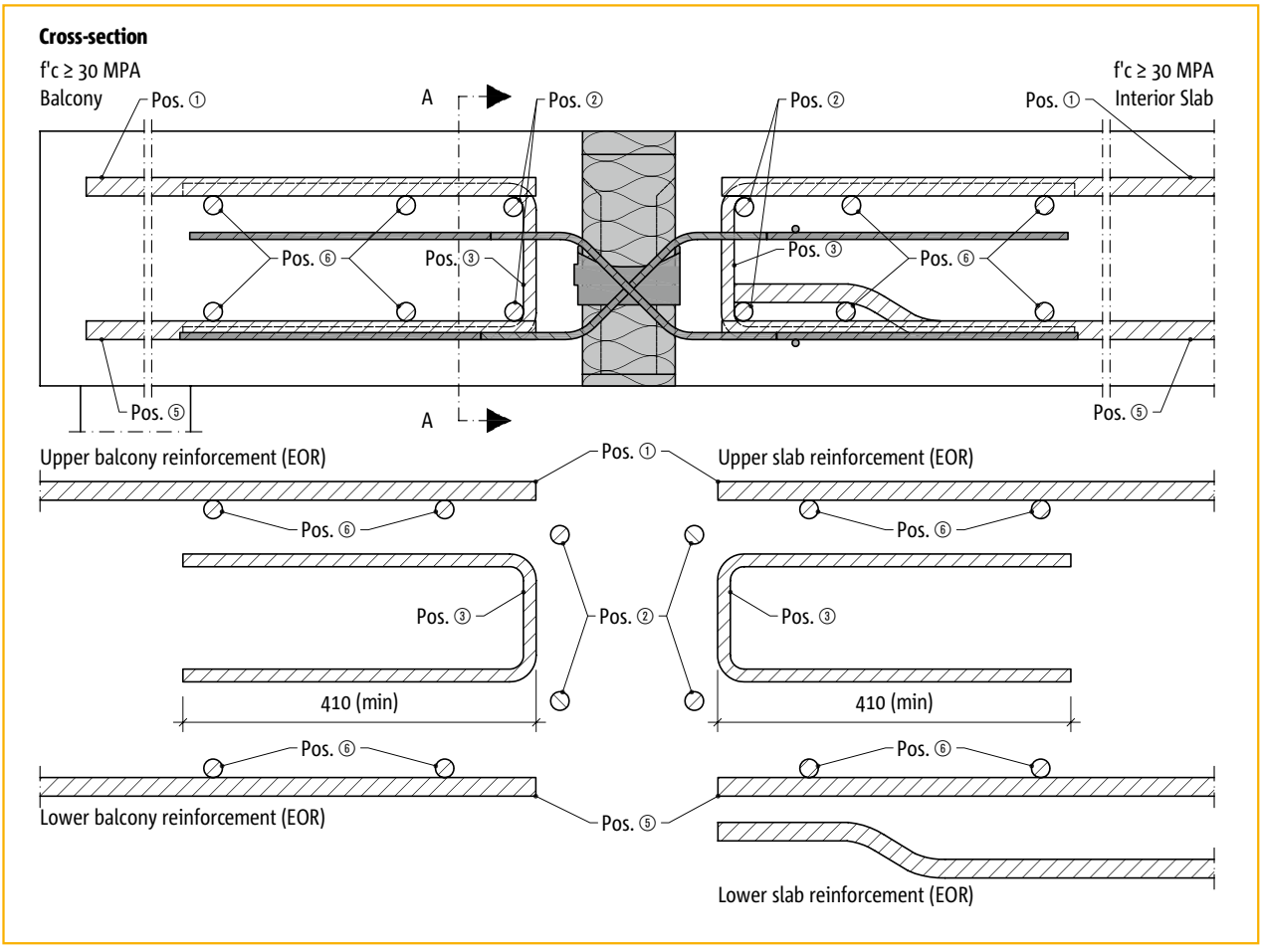
Note:

- These recommendations must be checked by the EOR and modified if necessary.

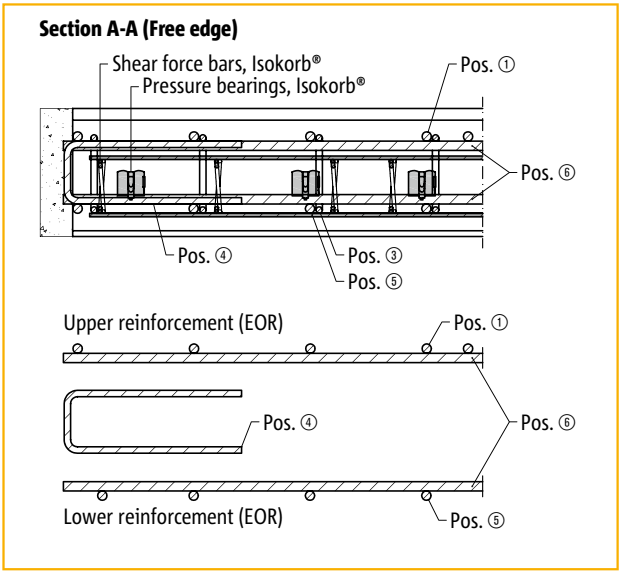
[1] with max e_v = 140 mm

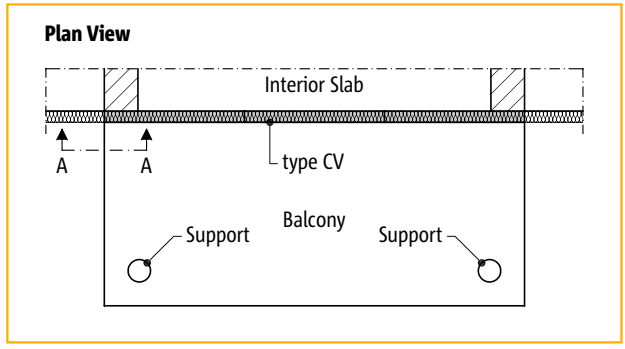
Schöck Isokorb® type CV
Cast-in-place reinforcement

The cast-in-place reinforcement is defined by the EOR of the building in accordance with structural requirements. The shear force bars of the Schöck Isokorb® type CV must be overlapped with the tensile reinforcement (Pos. 1). Positions 2 (longitudinal edge reinforcement),Pos. 3 (U-Bars) and Pos. 4 (U-Bars for the free balcony edge) must also be provided. The following is a suggestion for the reinforcement layout.



Cross section of recommended cast-in-place reinforcement (supplied by building contractor)





Section A-A Depiction of free balcony edge

Schöck Isokorb® type CV
Cast-in-place reinforcement, indirect support

Suggestion for cast-in-place connective reinforcement

For 100% section strength with a minimum concrete strength of 30MPa. The existing slab reinforcement can be taken into account for the required reinforcement of connections with Schöck Isokorb®.

Schöck Isokorb® type	CV10	CV20	CV30
Pos 1: Overlapping reinforcement upper layer			
Required cross-section area a_s [mm² / 1.0 m width]	In accordance with EOR specifications		
Pos 2: Longitudinal edge Reinforcement			
Alternative 1	4 x 10M	4 x 10M	4 x 10M
Alternative 2	4 x 15M	4 x 15M	4 x 15M
Pos 3: U-Bars for the slab edges			
Alternative 1	10M @ 250mm	10M @ 250mm	10M @ 250mm
Alternative 2	15M @ 350mm	15M @ 350mm	15M @ 350mm
Pos 4: U-bars for the free balcony edge			
Required cross-section area a_v [mm² / 1.0 m width]	In accordance with EOR specifications		
Pos 5: Reinforcement bottom layer			
Required cross-section area a_s [mm² / 1.0 m width]	In accordance with EOR specifications		
Pos 6: Longitudinal reinforcement			
Required cross-section area as [mm² / 1.0 m width]	In accordance with EOR specifications		

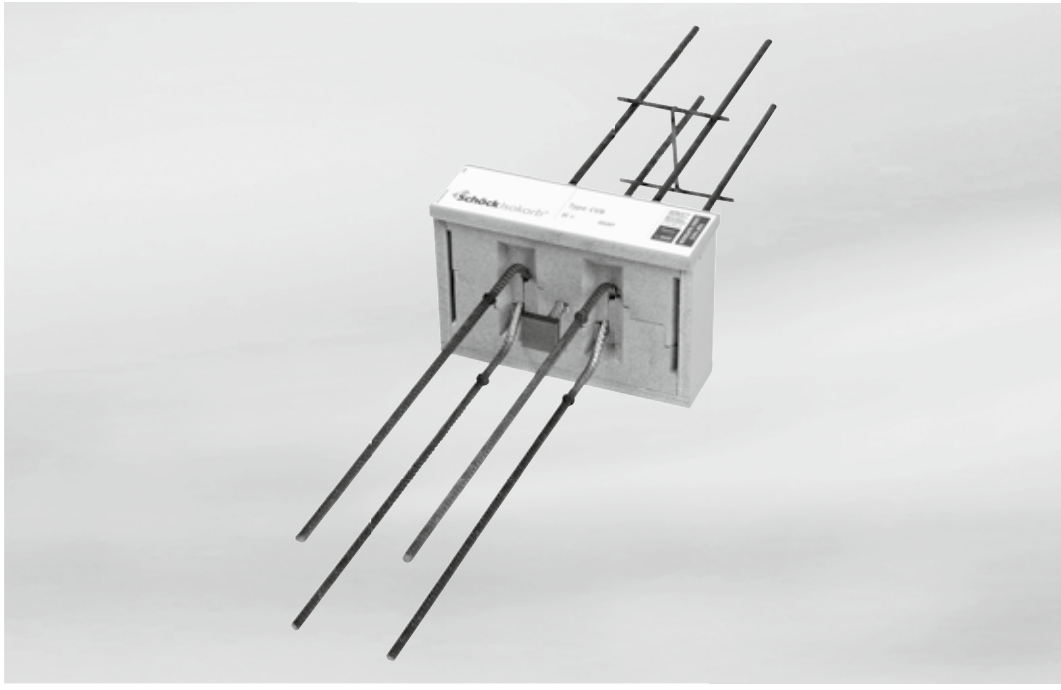
Notes:

- Pos. 4 should be chosen such that the link can be arranged between the legs of pos. 3.
- The upper and lower reinforcement of the connecting slabs must run as close as possible to the thermal insulation layer at both sides of the Schöck Isokorb®, taking the required concrete cover into consideration.
- All free edges must be bordered using structural U-bars as per EOR specifications..
- The centerline distance of any tension or shear bar from any free concrete edge, including expansion joints, must be at least 50 mm.
- The centerline distance of any pressure element from any free concrete edge, including expansion joints, must be at least 50 mm.
- The shear force reinforcement must be spliced to the tensile reinforcement in the slab to be connected. In cases in which shear force bars and pressure elements are not laid in one layer, the anchoring length for shear force bars must be determined in the compression zone in the same way as it is for for tension bars.
- The lap splice length provided by Schöck Isokorb® = the length of the tension bar from the face of the Isokorb® to the free end - Concrete Cover (CC)

Schöck Isokorb® type CV
Checklist

- ☐ Has the Schöck Isokorb® type that is suitable for the structural system been chosen? Type CV is considered to be a shear force connection only (hinge joint).
- ☐ Has the system span length (i.e., "ℓ") been used for the design?
- ☐ Have the factored member forces at the Schöck Isokorb® connection been determined at design level?
  Do the member forces at the Schöck Isokorb® connection include the effects of eccentricity of the connection?
- ☐ Has the critical concrete strength been taken into consideration in the choice of design table?
- ☐ Have both slabs adjacent to the Isokorb® been verified for bending and shear capacities by the EOR?
- ☐ Have the requirements with regard to fire re protection been determined, and has the relevant suffix (-R90 or R120) been added to the Isokorb® type designation in the design drawings?
- ☐ Has the maximum permissible expansion gap spacing been taken into consideration for the specific slab configuration?
- ☐ Have the horizontal loads such as those from earthquakes been taken into consideration? Additional EQ modules may be required.
- ☐ Has the connecting reinforcement in the balcony and interior slabs been defined by the EOR?
- ☐ When using type CV and fully prefabricated parts, has the cast-in-place strip of concrete (width ≥ 50 mm from pressure bearing elements) that is required to create the tight fit of the HTE pressure bearing been included in the design drawings?

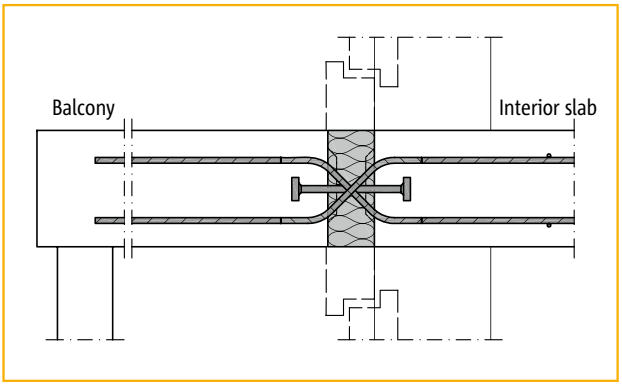
Schöck Isokorb® type CVB



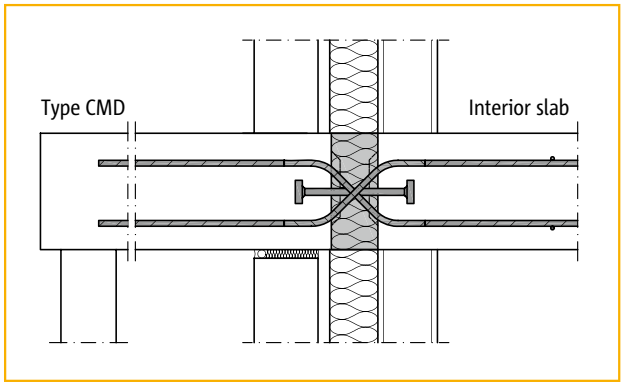
Schöck Isokorb® type CVB

The Schöck Isokorb® type CVB is suitable for supported reinforced concrete slabs with interior slab joists at interior slab level (CB concrete beam). It transmits positive vertical shear force (V).

Schöck Isokorb® type CVB
Section/element arrangement



Schöck Isokorb® type CVB with window wall systems and supported balcony



Schöck Isokorb® type CVB , supported balcony with steel studs, facing shell and insulation layer in between

Position of Schöck Isokorb® type CVB

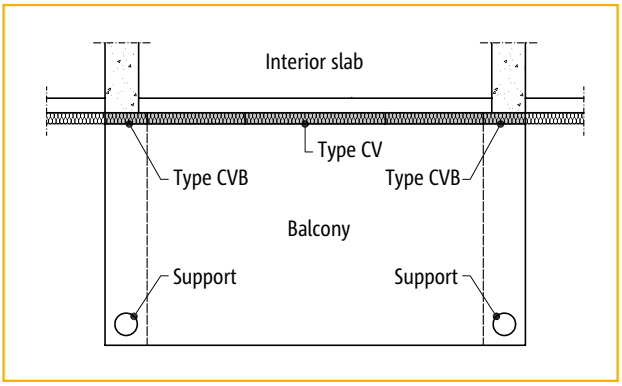
The Schöck Isokorb® type CVB should be located in the insulating layer.

Orientation of Schöck Isokorb® type CVB

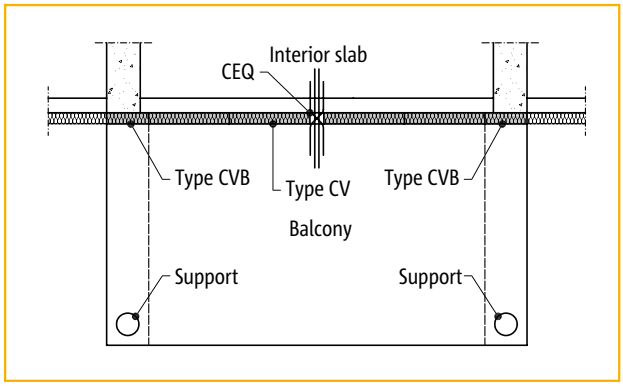
Attention: the Schöck Isokorb® type CVB does not have a symmetrical design.

- The lower spacing between the shear force bars and the insulating element at the bottom edge is always 40 mm. The upper spacing can vary.
- Pay attention to installation orientation and show a cross section view on the design drawings.
- The Schöck Isokorb® type CVB has the same design at the balcony side and the interior slab side.

Element arrangement



Schöck Isokorb® type CVB, balcony supported with interior slab joist at interior slab level.



Schöck Isokorb® type CVB balcony supported at three sides with tie member.

Note

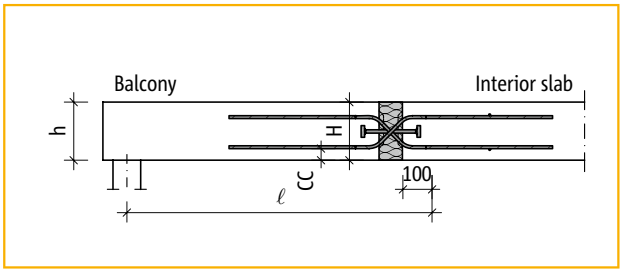
- The Schöck Isokorb® CEQ module must be used for horizontal loads and earthquake loads. With horizontal tensile forces at right angles to the outside wall greater than the existing shear force, the Schöck Isokorb® CEQ module must also be used.

Schöck Isokorb® type CVB
Slab geometry/span length/expansion joints

Recommended maximum span length
The maximum span length results from the shear resistance, V_r.

Span length for the structural calculations

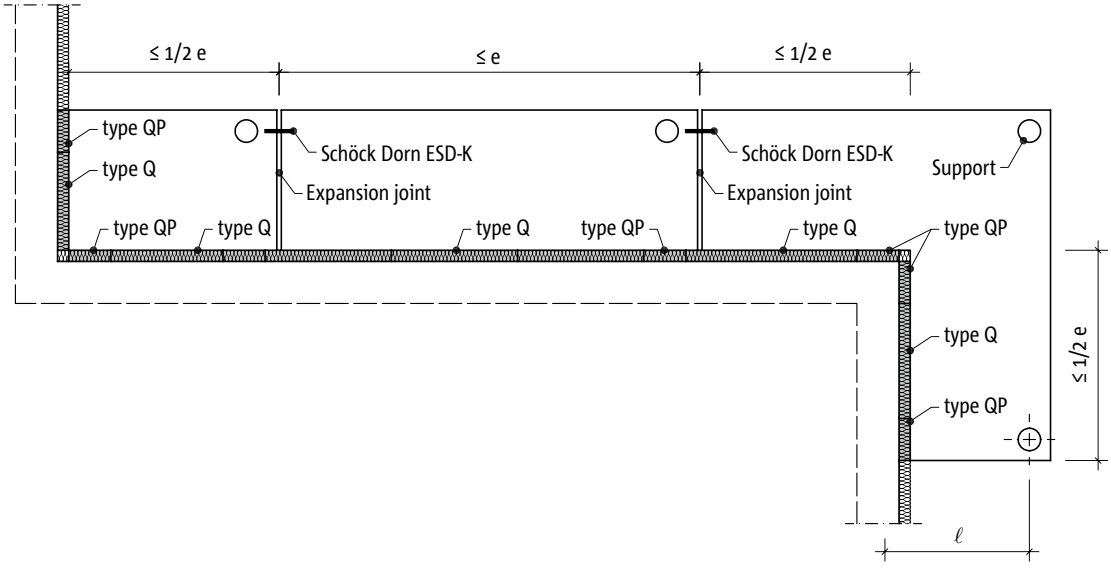
The support of the balcony is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Expansion joints (recommended balcony length)

The expansion joint spacing shown in the illustration corresponds to a temperature difference of ΔT = 70 °C.

Schöck Isokorb® type	CVB10	CVB20	CVB30
Minimum slab thickness h_{min} [mm]	180	180	180
Maximum expansion joint spacing e [m]	10.40	9.10	8.20



Schöck Isokorb® type CVB Expansion joint spacing

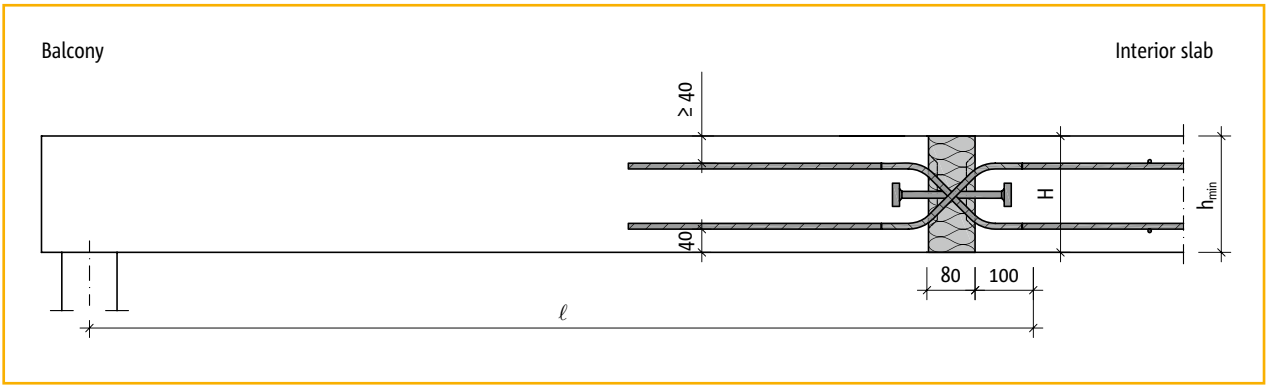
Note:

- The maximum expansion joint spacing must be verified by the EOR.
- The Schöck Isokorb® type CVB may be split at the non-reinforced locations. The spacing of the pressure elements from the free edge of the reinforced concrete slab must be at least 50 mm, and the axis spacing of the shear force bars must be at least 100 mm and no more than 150 mm.
- The expansion joint must be free to deform in the longitudinal direction, for which we recommend the A4 stainless steel Schöck Dorn ESD-K, for example.

Schöck Isokorb® type CVB
Cross-section/type designation

Concrete cover CC

The concrete cover of the Schöck Isokorb® type CVB is set to 40 mm (CC40) from below. The concrete cover is always greater than 40 mm if the minimum slab thickness is complied with.



Concrete cover with level balcony slab

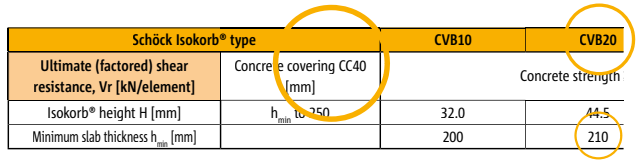
Minimum slab thickness

The following minimum slab thicknesses h_{min} must be complied with depending on the load capacity:

Schöck Isokorb® type	CVB10	CVB20	CVB30
Minimum slab thickness h_{min} [mm]	200	210	220

Type designation in design drawings

The following type designation specifies the Schöck Isokorb® type that is required.
The type designation is indicated on the design drawings.
The type designation is printed on the sticker of the Schöck Isokorb® type as a recognition feature.

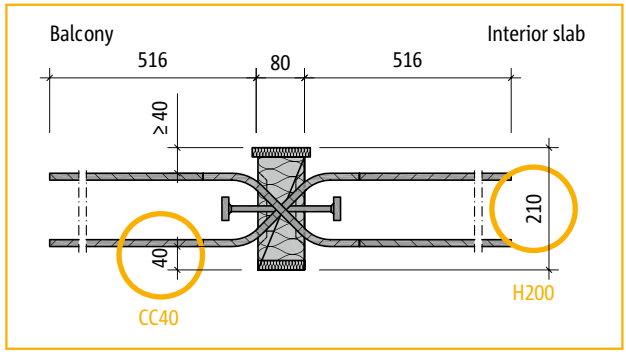


Schöck Isokorb® type		CVB10	CVB20
Ultimate (factored) shear resistance, Vr [kN/element]	Concrete covering CC40 [mm]	Concrete strength	
Isokorb® height H [mm]	h_{min} to 250	32.0	44.5
Minimum slab thickness h_{min} [mm]		200	210

Type designation in design drawings

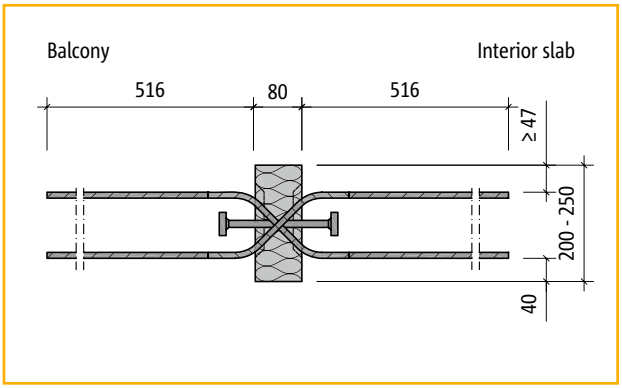
with fire protection **CVB20-CC40-H210-R90**

- Type/load capacity
- Concrete cover
- Isokorb® height
- Fire protection

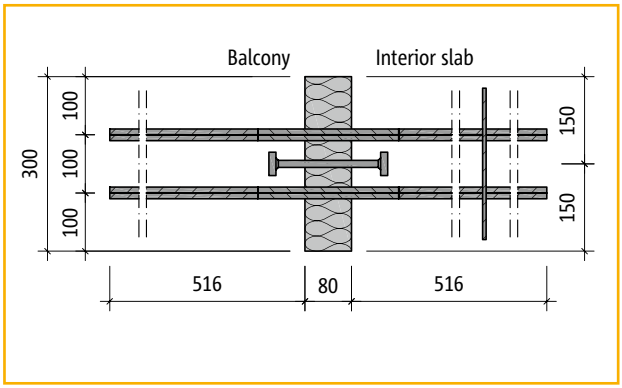


Schöck Isokorb® type CVB

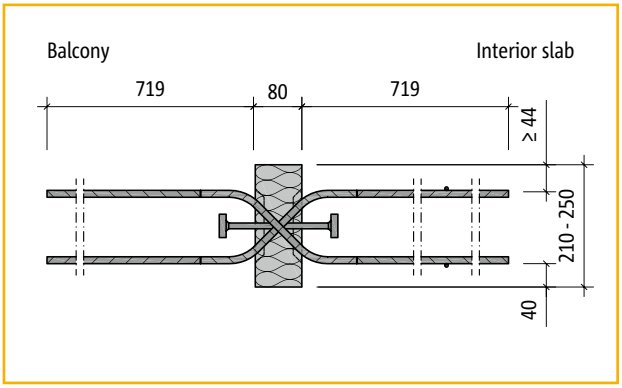
Concrete cover



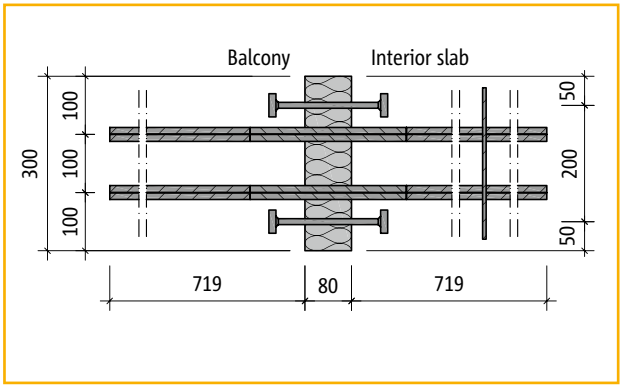
Cross-section of Schöck Isokorb® type CVB10



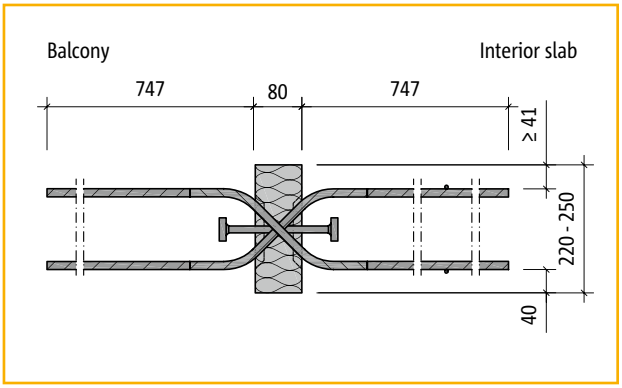
Overhead view of Schöck Isokorb® type CVB10 product



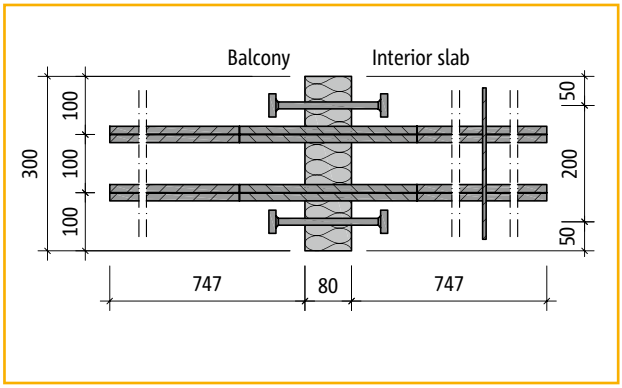
Cross-section of Schöck Isokorb® type CVB20



Overhead view of Schöck Isokorb® type CVB20 product



Cross-section of Schöck Isokorb® type CVB30



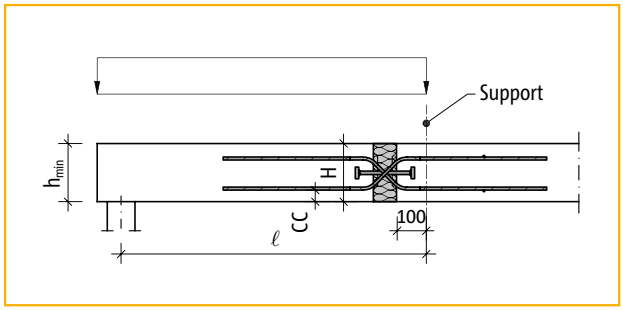
Overhead view of Schöck Isokorb® type CVB30 product

Schöck Isokorb® length and configuration

Schöck Isokorb® type	CVB10	CVB20	CVB30
Isokorb® length [m]	0.3	0.3	0.3
Isokorb® height [mm]	200 - 250	210 - 250	220 -250
Shear force bars	2 ø 10 + 2 ø 10	2 ø 12 + 2 ø 12	2 ø 14 + 2 ø 14
Steel pressure bearing pads (pc.)	1	2	2

Schöck Isokorb® type CVB
Design

The support is assumed to be 100 mm from the Schöck Isokorb® insulating element at the interior slab side.



Product selection table as per CSA 223.3-04

Schöck Isokorb® type		CVB10	CVB20	CVB30
Ultimate (factored) shear resistance, Vr [kN/element]	Concrete covering CC40 [mm]	Concrete strength ≥ 30 MPa		
Isokorb® height H [mm]	h_{min} to 250	32.0	44.5	64.0
Minimum slab thickness h_{min} [mm]		200	210	220

Notes

- With different balcony slab and floor slab concrete qualities, the weaker concrete should be used with the table above.
- The shear capacity of the slabs must be verified by the EOR.
- Because of the eccentric connection, a moment occurs at the slab edges at both sides of the Schöck Isokorb® type CVB. The transmission of this moment in the two connecting slabs must be verified in each individual case.
- The EOR must confirm the structural integrity of the slabs attached at both sides of the Schöck Isokorb®. When the reinforcement of the floor slab and the balcony slab which connect to the Schöck Isokorb® type CVB is being determined, it must be assumed that there is a hinge, since the Schöck Isokorb® type CVB can only transmit shear force.
- The capacities are considering a maximum permitted bar separation according CSA A23.3-04 Cl 12.14.2.3. This has to be taken into account by the EOR.

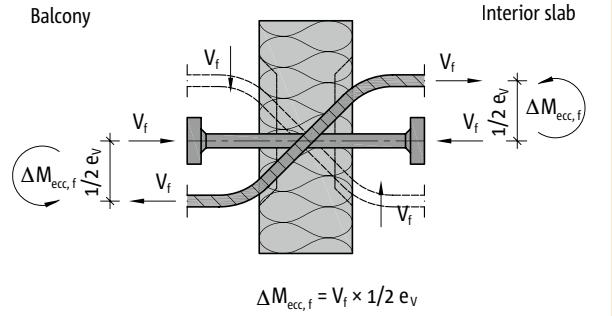
Schöck Isokorb® type CVB
Design

Deformation

An estimate of the additional deformation from the Schöck Isokorb® type CVB was made on the basis of component testing. In the tests, the bearing points or bearing edges are subjected to vertical deformation of approx. 0.8 to 1.0 mm.

Moments from eccentric connection

In order to measure the cast-in-place connecting reinforcement at both sides of the Schöck Isokorb® type CVB, moments from an eccentric connection must also be taken into consideration. Each of these moments must be overlaid with the moments from the planned load, providing that they act in the same direction.



Schöck Isokorb® length and configuration

Schöck Isokorb® type	CVB10	CVB20	CVB30
$\Delta M_{ecc,f}$ [1] [kNm]	1.9	3.1	4.6

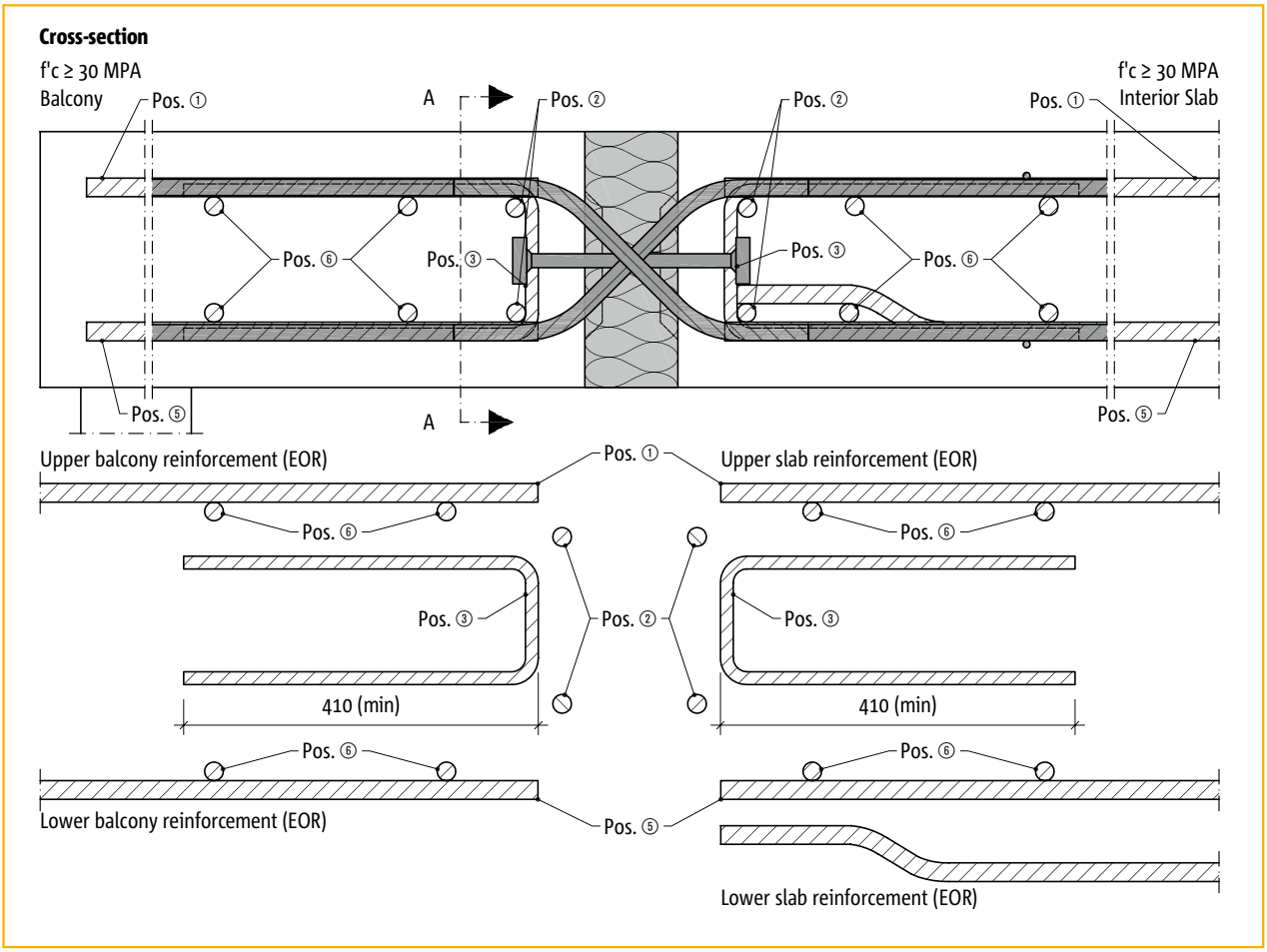
Note:

- These recommendations must be checked by the EOR and modified if necessary.

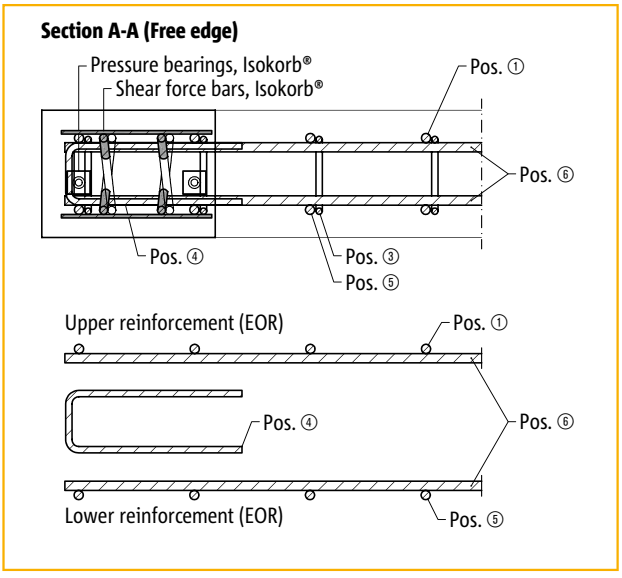
[1] with max z_v = 140 mm

Schöck Isokorb® type CVB
Cast-in-place reinforcement

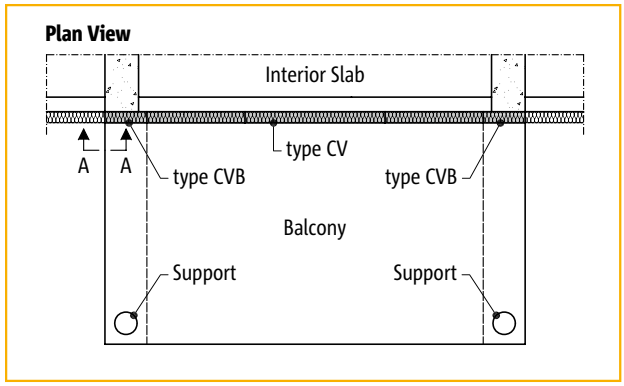
The cast-in-place reinforcement is defined by the EOR in accordance with structural requirements. The shear force bars of the Schöck Isokorb® type CVB must be overlapped with the tensile reinforcement (Pos. 1). Positions 2 (longitudinal edge reinforcement) and 3 (U-Bars) must also be provided. The following is a suggestion for the reinforcement layout.



Cross section of recommended cast-in-place reinforcement (suppled by the building contractor)



Section A-A Depiction of free balcony edge



Schöck Isokorb® type CVB
Cast-in-place reinforcement, indirect support

Suggestion for cast-in-place connective reinforcement

For 100% section strength with a minimum concrete strength of 30 MPa. The existing slab reinforcement can be taken into account for the required reinforcement of connections with Schöck Isokorb®.

Schöck Isokorb® type	CVB10	CVB20	CVB30
Pos 1: Overlapping reinforcement upper layer			
Required cross-section as [mm²/1.0 m width]	In accordance with EOR specifications		
Pos 2: Longitudinal edge reinforcement			
Alternative 1	4 x 10M	4 x 10M	4 x 10M
Alternative 2	4 x 15M	4 x 15M	4 x 15M
Pos 3: U-Bars for the slab edge			
Alternative 1	10M @ 250mm	10M @ 250mm	10M @ 250mm
Alternative 2	15M @ 350mm	15M @ 350mm	15M @ 350mm
Pos 4: U-Bars for the free balcony edge			
Required cross-section area a_s [mm²/1.0 m width]	In accordance with EOR specifications		
Pos 5: Reinforcement bottom layer			
Required cross-section area a_s [mm²/1.0 m width]]	In accordance with EOR specifications		
Pos 6: Longitudinal reinforcement			
Required cross-section area a_s [mm²/1.0 m width]	In accordance with EOR specifications		

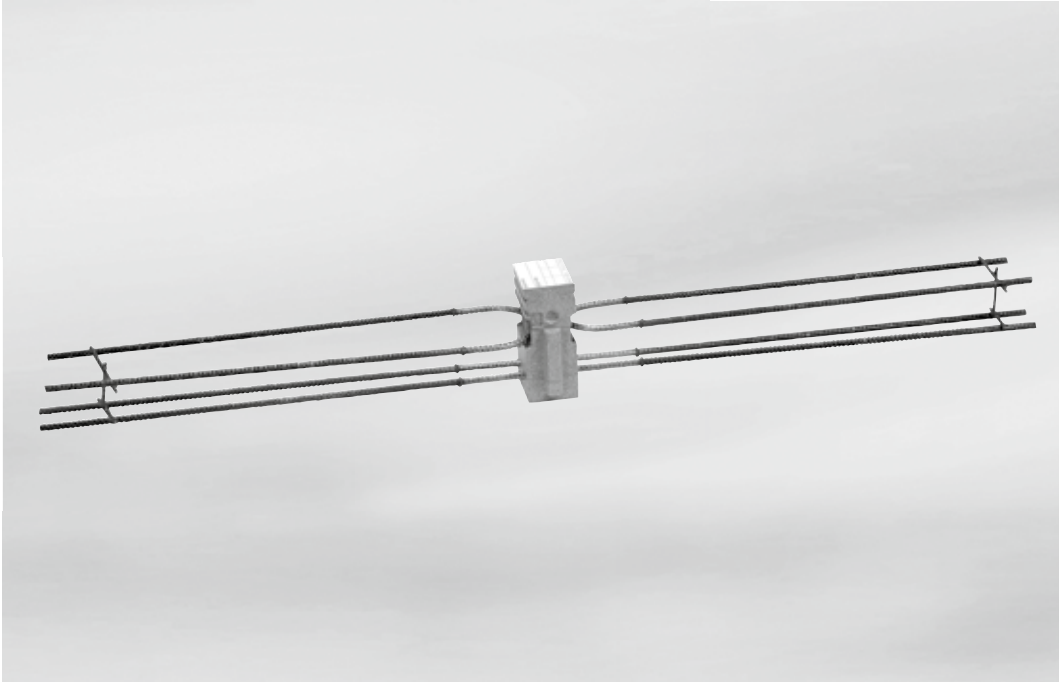
Notes:

- Pos. 4 should be chosen such that the U-Bars can be arranged between the legs of Pos. 3.
- The upper and lower reinforcement of the connecting slabs must run as close as possible to the thermal insulation layer at both sides of the Schöck Isokorb®, taking the required concrete cover into consideration.
- All free edges must be bordered using structural U-bars.
- The spacing of the tension/pressure bars from the free edge of the expansion gap must be at least 50 mm.
- The centerline distance of any pressure element from any free concrete edge, including expansion joints, must be at least 50 mm.
- The centerline distance of any tension or + shear bar from any free concrete edge, including expansion joints, must be at least 50 mm.
- The shear force reinforcement must be spliced to the tensile reinforcement in the slab to be connected. In cases in which shear force bars and pressure elements are not laid in the same layer, the anchoring length of the shear force bars must also be determined in the compression zone, as it does for the tension bars.
- The lap splice length provided by Schöck Isokorb® = the length of the tension bar from the face of the Isokorb® to the free end - Concrete Cover (CC)

Schöck Isokorb® type CVB
Checkliste

- ☐ Has the Schöck Isokorb® type that is suitable for the structural system been chosen? Type CV is considered to be a shear force connection only (hinge joint).
- ☐ Has the system span length (i.e., "ℓ") been used for the design?
- ☐ Has the respective shear resistance of the slab been checked with V_r of the Schöck Isokorb®?
- ☐ Have the factored member forces at the Schöck Isokorb® connection been determined at design level?
- ☐ Do the member forces at the Schöck Isokorb® connection include the effects of eccentricity of the connection?
- ☐ Has the critical concrete strength been taken into consideration in the choice of design table?
- ☐ Have both slabs adjacent to the Isokorb® been verified for bending and shear capacities by the EOR?
- ☐ Have the requirements with regard to fire protection been determined, and has the relevant suffix (-R90 or R120) been added to the Isokorb® type designation in the design drawings?
- ☐ Has the maximum permissible expansion gap spacing been taken into consideration for the specific slab configuration?
- ☐ Have the horizontal loads such as those from wind pressure or earthquakes been taken into consideration? Additional CEQ types may be required.
- ☐ Has the connecting reinforcement in the balcony and interior slabs been defined by the EOR?

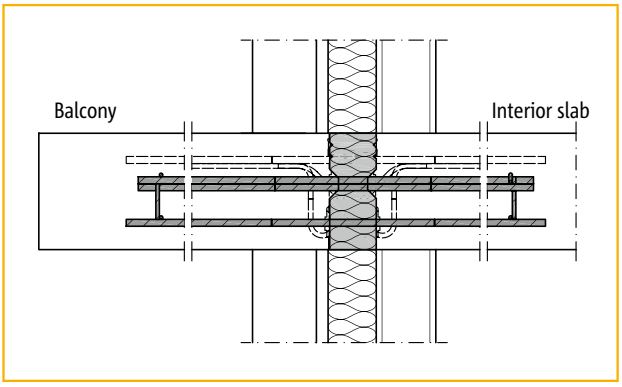
Schöck Isokorb® type CEQ



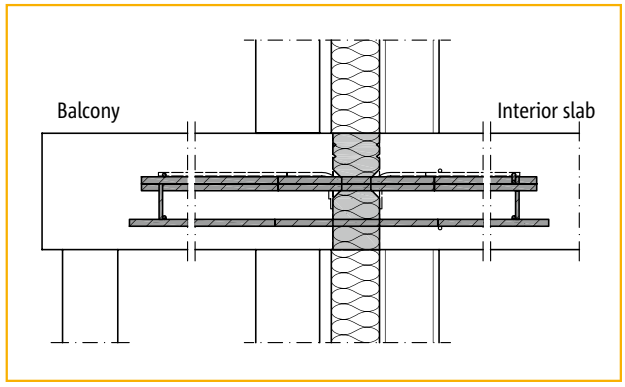
Schöck Isokorb® type module CEQ 2

The Schöck Isokorb® type CEQ transmits loads from earthquakes from the balcony into the floor slab in interaction with the Schöck Isokorb® type CM, the Schöck Isokorb® type CMD or the Schöck Isokorb® type CV. The Schöck Isokorb® type CEQ1 absorbs shear force parallel to the insulating layer. The Schöck Isokorb® type CEQ2 absorbs shear force parallel to the insulating layer, pressure and tensile force normal to the insulating layer and positive moments.

Schöck Isokorb® type CEQ
Section/element arrangement



Schöck Isokorb® module CEQ with type CM steel studs, facing shell and insulation layer in between



Schöck Isokorb® module CEQ with type CV, supported balcony with steel studs, facing shell and insulation layer in between

Position of Schöck Isokorb® module CEQ

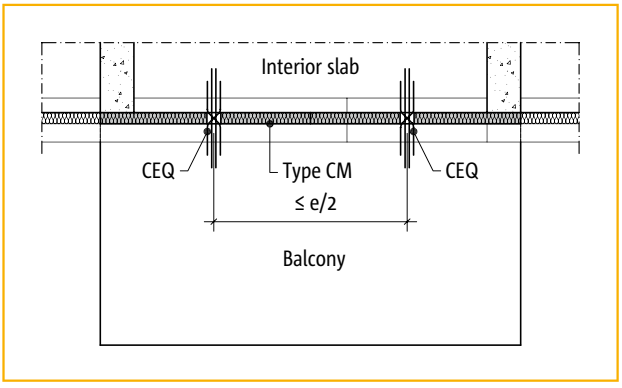
The Schöck Isokorb® module CEQ should be located in the insulating layer.

Orientation of Schöck Isokorb® module CEQ

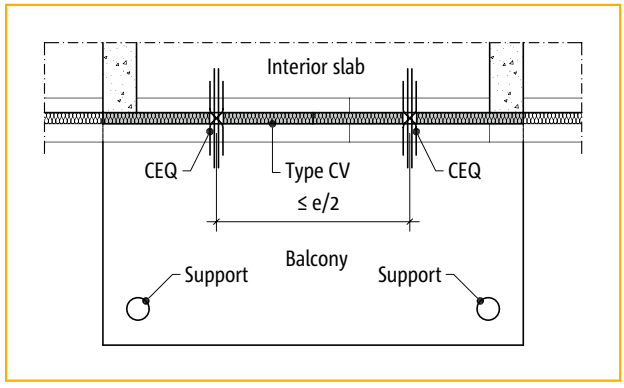
Attention: the Schöck Isokorb® type CEQ does not have a symmetrical design. The tension bar must be at the bottom.

- The tension bar must be at the bottom.
- The horizontal shear force bars are always 113 mm from the bottom edge of the Schöck Isokorb® type CEQ and the underside of the slab.
- Pay attention to installation orientation and show a cross section view on the design drawings.
- In order to increase installation safety, the Schöck Isokorb® type CVB has the same design at the balcony side and the interior slab side.

Element arrangement



Schöck Isokorb® module CEQ with type CM indirect support

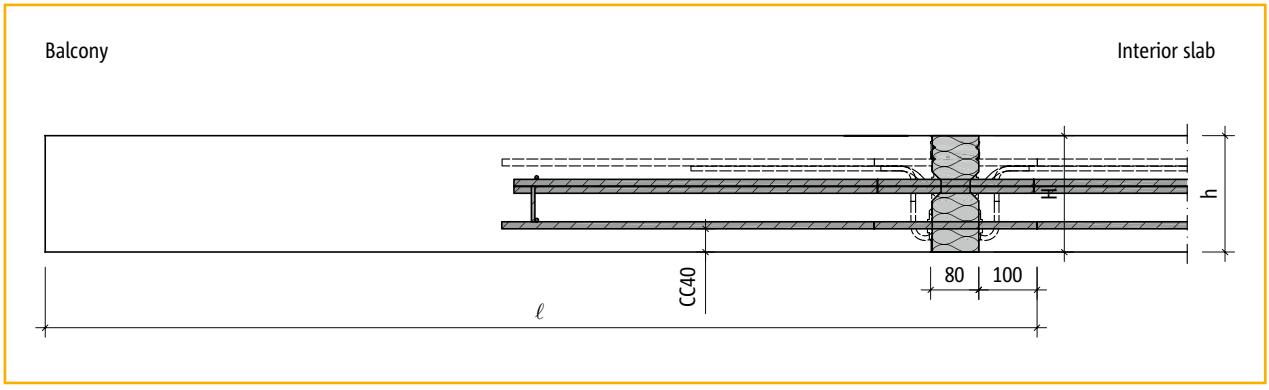


Schöck Isokorb® module CEQ with type CV indirect support

Schöck Isokorb® type CEQ
Concrete cover/expansion joints

Concrete cover CC

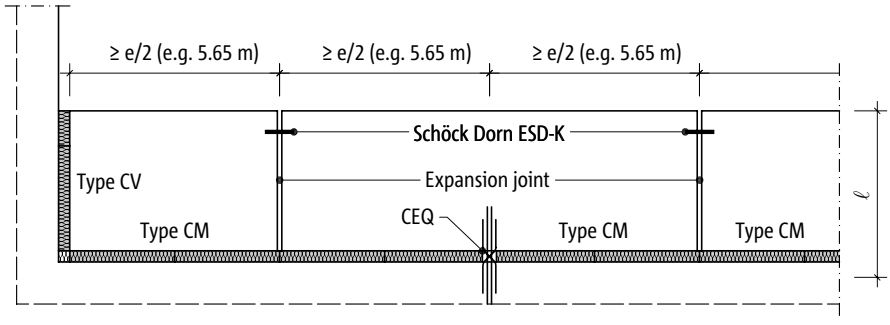
The concrete cover of the Schöck Isokorb® module CEQ2 is set to 40 mm.



Concrete cover of Schöck Isokorb® module CEQ

Expansion joints (recommended balcony length)

The Schöck Isokorb® EQ modules may be arranged with maximum spacing of 1/2 of the expansion joint distance of the Schöck Isokorb® type. These are shown in the respective product chapter. The illustration shows the example of combination with the Schöck Isokorb® type CM.
The expansion joint spacing shown in the illustration corresponds to a temperature difference of ΔT = 70 °C.



Schöck Isokorb® module CEQ expansion joints in combination with Schöck Isokorb® type CM

Note:

- The maximum expansion joint spacing must be verified by the EOR.

Schöck Isokorb® type CEQ

Type designation/product cross-section/overhead view of product

Type designation in design drawings

The following type designation identifies the Schöck Isokorb® type that is required.
The type designation is indicated on the design drawings.
The type designation is printed on the sticker of the Schöck Isokorb® module as a recognition feature.

Concrete strength ≥ 30 MPa		Schöck Isokorb® type	
ncrete cover CC = 40 mm	Isokorb® height H [mm]	CEQ1	CEQ2
	180		3.6
	190		4.0
	200		4.5
imate (factored) moment esistance $M_{,}$ [KNm/m]	210		4.9
	220		5.3
	230		5.7
	240		6.1
	250		6.5

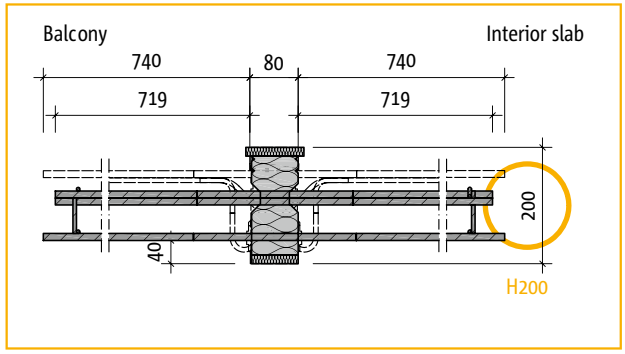
CEQ

Products

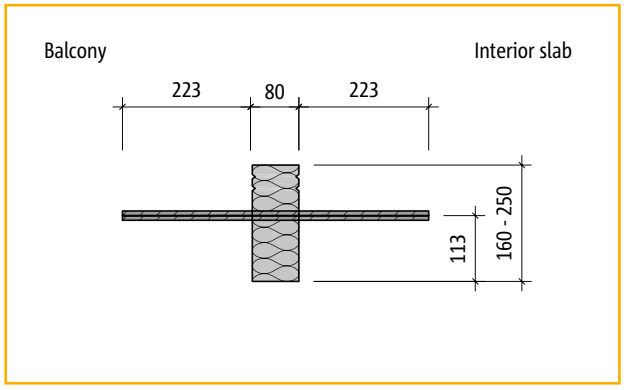
Type designation in design drawings

with fire protection **CEQ2-H200-R90**

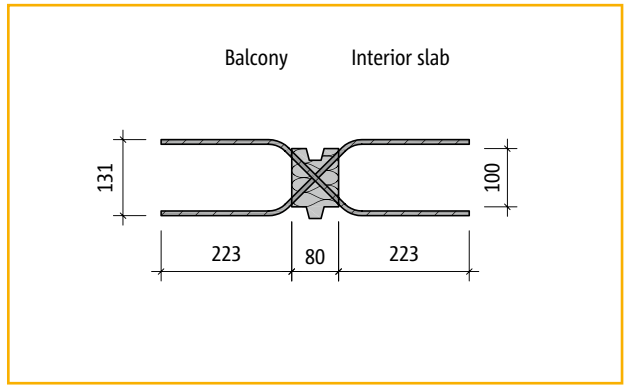
Type/load capacity
Isokorb® height
Fire protection



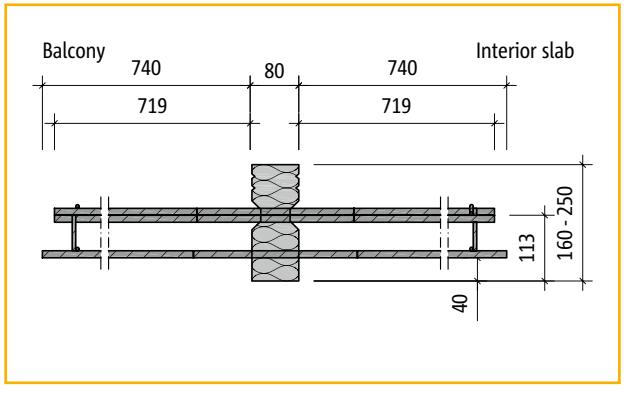
Cross-section/Overhead view of product



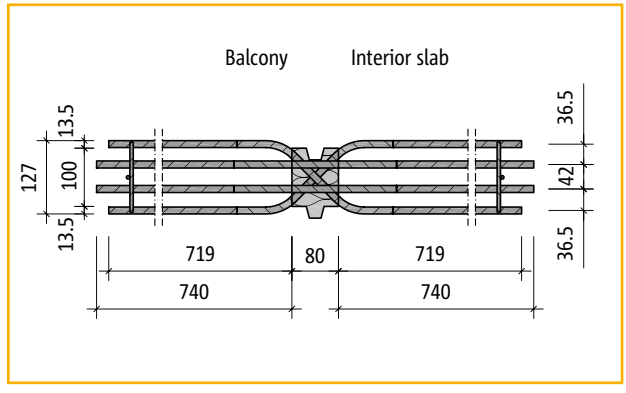
Product cross-section of Schöck Isokorb® module CEQ1



Overhead view of Schöck Isokorb® module CEQ1



Product cross-section of Schöck Isokorb® module CEQ2



Overhead view of Schöck Isokorb® module CEQ2

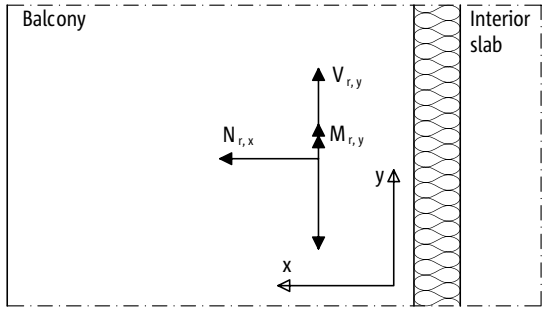
Schöck Isokorb® type CEQ
Configuration/design

Schöck Isokorb® length and configuration

Schöck Isokorb® type	CEQ1	CEQ2
Isokorb® length [m]	0.1	0.1
Isokorb® height [mm]	180 - 250	180 - 250
Shear force bars	1 ø 8 + 1 ø 8	1 ø 12 + 1 ø 12
Tension bars, bottom	–	2 ø 12

Design

$M_{r,y}$: Design value of positive moment
$N_{r,x}$: Normal design force normal to insulating level.
$V_{r,y}$: Design shear force parallel to insulating level.



Schöck Isokorb® type CEQ sign convention

Product selection table as per CSA A23.3-04

Concrete strength ≥ 30 MPa		Schöck Isokorb® type	
Concrete cover CC = 40 mm	Isokorb® height H [mm]	CEQ1	CEQ2
Ultimate (factored) moment resistance M_r [KNm/m]	180		3.6
	190		4.0
	200		4.5
	210		4.9
	220		5.3
	230		5.7
	240		6.1
	250		6.5
Ultimate (factored) normal force resistance N_r [kN]	180-250	0	+41.3
Ultimate (factored) shear resistance V_r [kN/m]	180-200	±5.9	±27.2
	210	±5.6	
	220	±5.0	
	230	±4.5	
	240	±4.1	
	250	±3.7	

Notes

- The design values relate to the individual element.
- $M_{r,y}$ and $N_{r,y}$ do not occur simultaneously. The EOR must consider the interaction between bending moment and normal (axial) force.

Schöck Isokorb® type CEQ
Checklist

- ☐ Have the factored member forces at the Schöck Isokorb® connection been determined at design level?
- ☐ Has the critical concrete strength been taken into consideration in the choice of design table?
- ☐ Have the requirements with regard to fire protection been determined, and has the relevant suffix (-R90 or R120) been added to the Isokorb® type designation in the design drawings?
- ☐ Have the maximum permissible expansion joint distances "e/2" from the fixed point been taken into consideration?
- ☐ Has the moment resistance of the CM/CEQ assembly been reduced (by 1/1.1) to account for the installation of the CEQ module?

Schöck Isokorb® type S22

Schöck Isokorb® type S22

The Schöck Isokorb® type S22 is used to transmit normal force and shear force. Moments can be transmitted by combining several modules.

Schöck Isokorb® type S22
Scope of application/anti-corrosion protection/fire protection

Scope of application

- The Schöck Isokorb® type S22 transmits normal force, vertical force and horizontal force. Moments can also be transmitted by combining several Schöck Isokorb® type S22.
- The Schöck Isokorb® type S22 is only certified for static loads like dead load, live load, wind, snow, earthquake.
- The Schöck Isokorb® type S22 is unsuitable for absorbing torsion moments Torsion moments should be absorbed by the connecting construction or alternatively by combining several types S22.
- Special boundary conditions must be taken into consideration when used in columns as a result of slab rotating angles and imperfections. Please contact the Schöck design department.

Anti-corrosion protection

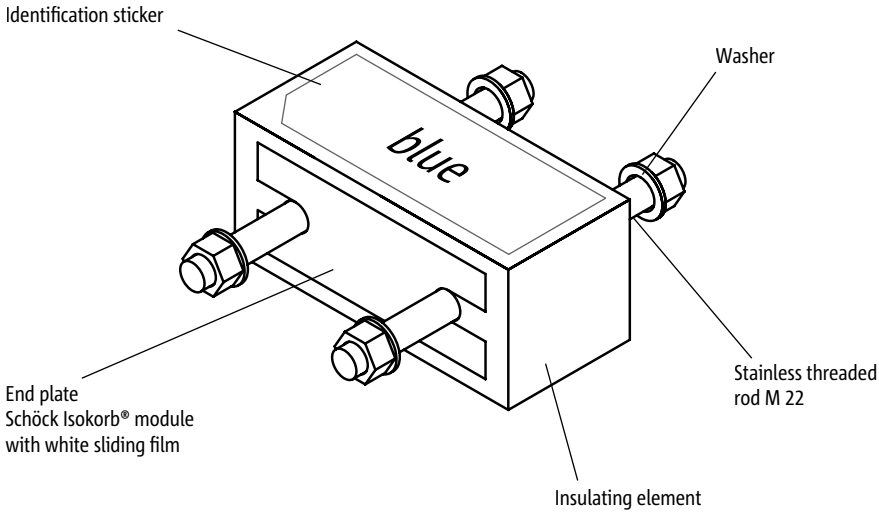
- The stainless steel used for Schöck Isokorb® type S22 corresponds to material no.: 1.4401, 1.4404 or 1.4571.
  The S22 unit components will have a typical corrosion resistance expected for Mo-Cr-Ni austenitic stainless steels.
  This can be more accurately quantified by reference to specialist literature such as SCI Publication P291 – Structural Design of Stainless Steel.

- Bimetallic corrosion
  The area of the galvanised steel is greater than the area of the stainless steel (bolts, washer and butt stop). As a result bimetallic corrosion that could lead to failure can be excluded as far as Schöck products are concerned, when using Schock Isokorb® type S22 with a galvanised or paint treated front plate.

- Stress corrosion cracking
  An appropriate Schöck protection system needs to be provided in environments with a high chlorine content (e.g. inside indoor swimming pools, ...). For more information please contact our design department.

Fire protection
The same on-site fire safety measures that apply to the overall load-bearing structure also apply to any freely accessible components of the Schöck Isokorb® type S22 or to any components situated inside the insulating layer. For more information please contact our Schöck design department.

Schöck Isokorb® type S22
Components



Naming of Schöck Isokorb® type S22 components

Schöck Isokorb® type S22
Materials

Comparable Steel Materials

Clause 5.1.3 and 5.1.7 of CSA S16-09 indicate the approved material specifications for structural steel and bolts. None of these specifications include stainless steel. The use of steel specifications (CSA and/or ASTM) other than those listed lies within the engineering judgement of the engineer of record.

While different international standards will not result in equivalent structural steel, the materials used in the fabrication of the thermal break elements are comparable to structural steel as required by CSA S16-09. The table above shows the mechanical properties and some chemical composition of the materials used in the Schöck Isokorb® along with a comparable structural steel per the CSA specifications.

It is our understanding that the CSA S16-09 would permit use of stainless steel materials as specified by European standards when performing structural steel design calculations. The EOR should verify this and employ sound engineering judgement when specifying Schöck Isokorb® for use under jurisdiction of the CSA specifiations.

Materials for Schöck Isokorb®

Materials for Schöck Isokorb®	Material	Comparable to
Stainless Steel	Mo-Cr-Ni-austenitic stainless steel compliant with German Standard grades 1.4401, 1.4404 and 1.4571 (Choice of Grade at Manufacturer's Discretion).	
Threaded rods M22 d_b= 22mm	S460 (German Standard) Nominal Tensile Strength T_{ult} := 600 N/mm² Minimum Yield Stress T_y := 390 N/mm² Nominal Shear Stress F_{nv} := 300 N/mm²	A 307 Grade A (CSA G40.20) Nominal Tensile Strength T_{ult} = 414 MPa Elongation 18%
Rectangular hollow profile w/h/d = 50mm/50mm/3mm	S 355 (German Standard) Nominal Tensile Strength T_{ult} := 510 N/mm² Minimum Yield Stress T_y := 355 N/mm²	350W (CSA G40.20) Nominal Tensile Strength T_{ult} = 450-620 MPa Minimum Yield Strength T_y = 350 MPaMin Elongation 22%
Module End Plate	S 275 (German Standard) Nominal Tensile Strength T_{ult} := 430 N/mm² Minimum Yield Stress T_y := 275 N/mm²	300W (CSA G40.20) Nominal Tensile Strength T_{ult} = 450-620 MPa Minimum Yield Strength T_y = 300 MPaMin Elongation 23%
Insulation material	Polystyrene hard foam (Neopor R) k = 0.031 W/(m × K)	
Sliding film	PTFE film	

Schöck Isokorb® type S22
Element arrangements

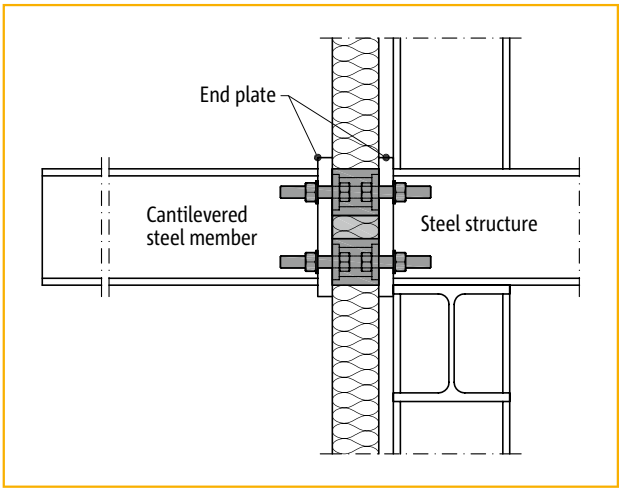


Figure 1: Combination of 2 Schöck Isokorb® type S22 for unsupported cantilevered steel structures

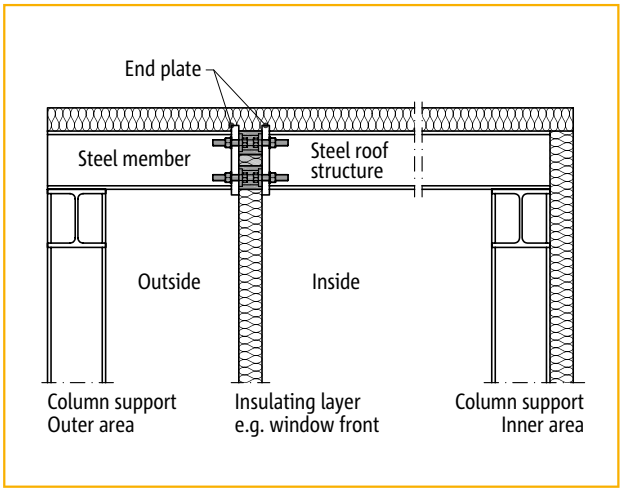


Figure 2: Schöck Isokorb® type S22 for separation within the structural system

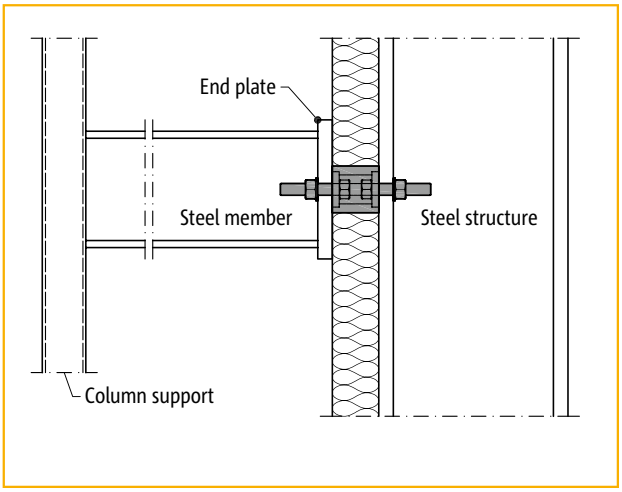


Figure 3: Schöck Isokorb® type S22 for supported steel structures

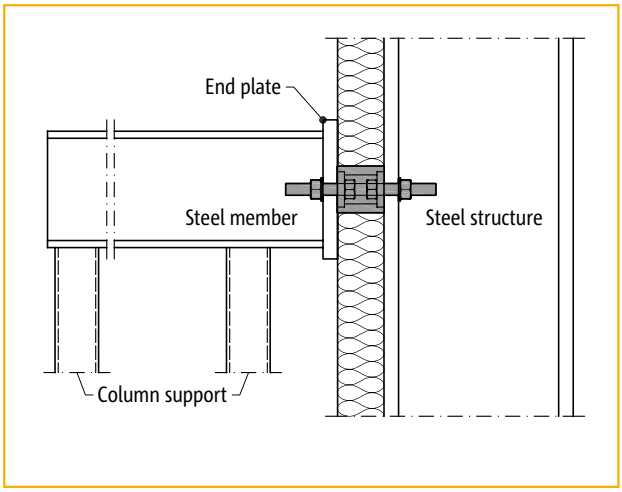


Figure 4: Schöck Isokorb® type S22 for restrained steel structures

Position of Schöck Isokorb® type S22

The Schöck Isokorb® type S22 should be located in the insulating layer.

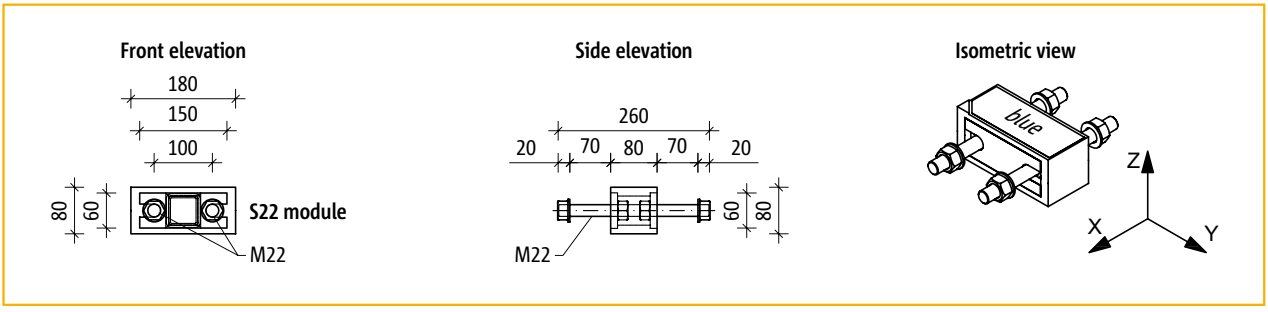
[1] End plate not provided by Schöck

Schöck Isokorb® type S22
Views/dimensions

Schöck Isokorb® type S22

The S22 module is used to resist compressive forces, tensile forces and shear forces. It consists of an insulating element (180 (L) x 80 (W) x 80 (D) mm), two stainless threaded bars with corresponding nuts and a rectangular hollow section which is welded into the module. The rectangular hollow section transmits the shear forces. The element can transmit forces in the x, y and z-direction. Different load combinations, including tensile forces, can be carried by the type S22, although the interaction condition $3V_d + 2\,H_d + F_{t,d} = \max F_{t,d} \leq F_{t,Rd}$ must be satisfied.

Schöck Isokorb® type S22



Views - Schöck Isokorb® type S22

Notes:

- If required, the insulating element can be cut off up to the steel plates (150 × 60 for the type S22)
- The possible attachment length for the end plates of the connecting structure is 70 mm
- The horizontal distance between the threaded rods M22 of 100mm is fix

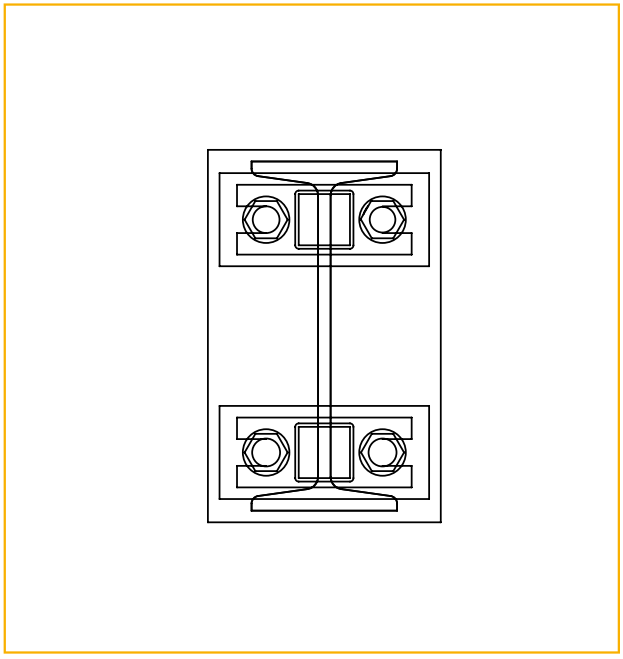
Schöck Isokorb® module S22
Combination options

Combination options for Schöck Isokorb® type S22

A moment can be transferred from the exterior structure to the interior structure with 2 Schöck Isokorb® type S22 arranged on top of each other.

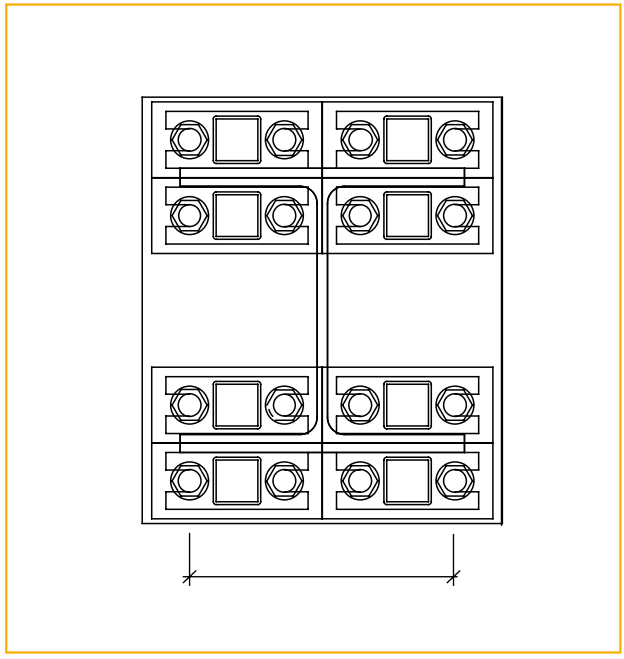
The height that is required to transfer the moment is achieved using 2 Schöck Isokorb® modules and insulating adapters. The adapters are available in heights of 20 mm or 30 mm. Several insulating adapters can be arranged on top of each other. The quantity, arrangement and spacing of the modules depends on the type of load and the level thereof, and can be adapted accordingly.

Front elevation

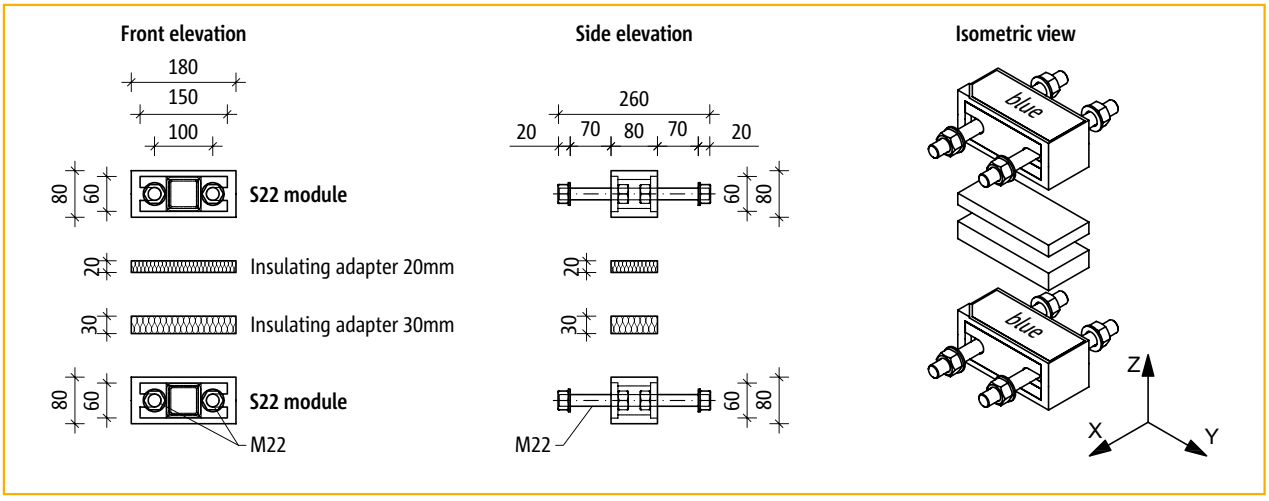


Example arrangement of Schöck Isokorb® modules S22 for transmitting increased bending moment, see also design example page 112

Front elevation



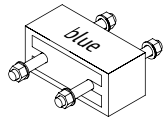
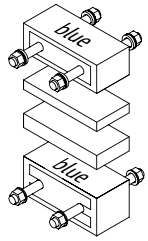
Example arrangement of Schöck Isokorb® modules S22 for transmitting increased bending moment, see also design example page 114

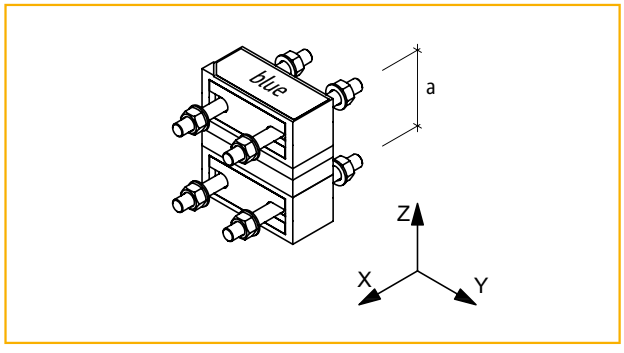


Views - Schöck Isokorb® two modules S22 combination

The required number of insulating adapters is determined by the Schöck Design department and enclosed with the delivery.

Schöck Isokorb® type S22
Design and capacity table

Schöck Isokorb® type	S22 modules	Combination 2 x S22
Design values per module (ULS)		
Horizontal Shear Resistance $V_{r,h}$	±6 kN[3)5)]	±6 kN[5)]
Vertical Shear Resistance $V_{r,v}$	36 kN[3)]	36 kN
Tension Resistance T_r Compressive Resistance C_r	225 kN[3)]	225 kN[3)]
Moment Resistance $M_{r,y}$	0 kNm[4)]	a × T_r[1)]
Moment Resistance $M_{r,z}$	[2)5)]	[2)5)]



Schöck Isokorb® two modules S22

1) a = distance between the tension rods and compression rods of the Isokorb® element (inner lever arm), minimum possible centre line separation between tension bars and compression bars = 50 mm (without insulating adapters after processing of the polystyrene.
2) We recommend that you discuss the static system and calculations with the Schöck design department.
3) The interaction 3 $V_{f,v}$ + 2 $V_{f,h}$ + T_f = max $T_f \leq T_r$ needs to be taken into account in the event of simultaneous tensile force and shear force loads.
4) When using at least two modules arranged one above the other, it is possible to transfer both positive and negative forces (moments and shear forces) in accordance with the design variants on pages 112 - 117.
5) Please make sure that you read the notes on expansion joints/fatigue resistance on pages 109 - 111.

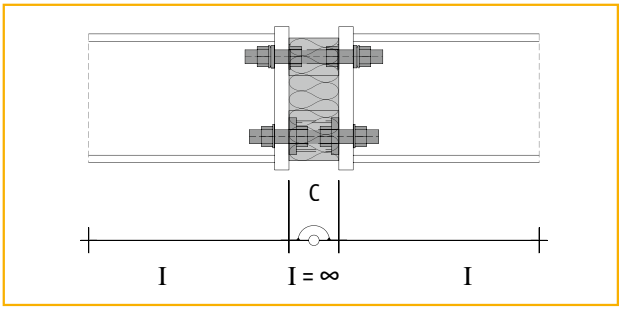
Schöck Isokorb® type S22
Torsion spring strength/notes on calculations

Estimation of deformation variables due to M_c in the Schöck Isokorb® connection

Torsion spring strength/buckling angle resulting from bending moment from unfactored loads		
Design variants	**Torsion spring strength c [kNmm/rad]**	**Buckling angle φ [rad]**
Bolt	$370 \times a^2$	$\varphi = \frac{M_c}{C}$
No. 1 - see page 112	$600 \times a^2$	
No. 2 - see page 114	$2400 \times a^2$	

a [mm] = refer to the design variants on pages 112-114.
M_c = bending moment from unfactored loads.
Deformations resulting from normal forces and shear forces can be ignored.
Values in table above assume average secant modulus of stainless steel under working load of 179 kN/mm²

Combination options of the Schöck Isokorb® type S22 are shown on the next pages.



Static model for the estimation of flexural stiffness

Notes on calculations

- Basis:
  The design capacities of the Schöck Isokorb® type S22 have been independently checked and approved as compliant with CSA S16.09. The design values must be compared with factored loading in accordance with limit states design as prescribed by the National Building Code of Canada (NBCC)..

- Certification:
  The structural engineering firm, Fast + Epp, performed assessment calculations to CSA S16-09 of Schock Isokorb® type 22. The calculations confirmed that the predicted resistances of the this component meet or exceed the design values published in the technical manual.

- End plate thickness:
  The end plates of the connecting steel structure must be designed by the EOR. A possible verification method is shown on page 117.

- Dynamic loads:
  The Schöck Isokorb® type S22 is only intended for use with the following loads:
  i.e. gravity, snow,wind, live load, dead load,earthquake, temperature.

Schöck Isokorb® type S22
Connecting structure

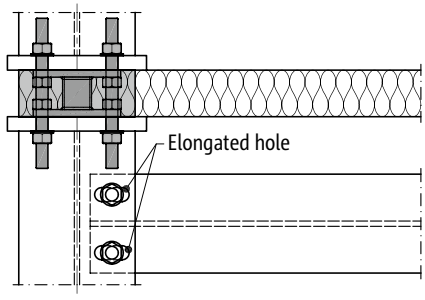
Connecting structure

- The end plates of the connecting structure to be designed by the EOR and are not supplied by Schöck According to CSA S16.1 the vertical force can be transmitted up to hole tolerances of 2 m. A diameter of 24mm for the bolt hole is recommended.
- Only loads that are essentially static may be transmitted from the connecting structure into the Schöck Isokorb® type S22.
- Undesigned eccentric loads from slab torsion, for example, must be avoided.
- Verification of torsion moment resistance must be provided in the connecting structure. Aletrnatively it could be absorbed by combining several types S22.
- The connecting structure must be designed in such a way that vertical and horizontal force is introduced into the end plate of the Schöck Isokorb® type S22 by contact from the end plate of the connecting structure, without space between type S22 and end plate.
- It is recommended designing the connecting steel structure in such a way that no fatigue loads from temperature deformation affects the Schock Isokorb® type S22. If it is not possible to avoid this load, please pay attention to the chapter entitled Expansion Joints.

Schöck Isokorb® type S22
Expansion joints/fatigue resistance

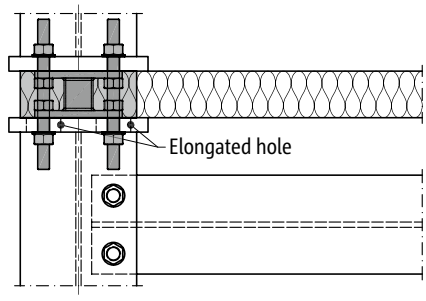
Expansion joints
Alternating temperatures cause length changes in the steel profiles attached to the Schock Isokorb® S22 module and can induce horizontal fatigue loads in the Schock Isokorb® type S22.
We recommend designing the connecting steel structure in such a way that no fatigue loads from temperature deformation affect the Schock Isokorb® type S22. For this purpose, the end plate can be designed with horizontal elongated holes.
Alternatively, the secondary structure can be attached to the primary structure in such a way to allow for the horizontal movement.

Detail 1



Detail 1: Adjustable attachment of secondary support structure to main support structure with slotted connection to accommodate thernal movement

Detail 2



Detail 2: Fixed attachment of secondary support structure to main support structure with slotted connection to accommodate thernal movement.

However, if fatigue loads caused by temperature deformation occur at the Schock Isokorb® type S22, expansion joints must be provided in the connected structure.

Effective deformation length l_{eff}
The term „effective deformation length" describes the length of the continuous exterior beam between the Isokorb® connections. This length will determine the fatigue resistance design.

Expansion joint length l_{ex}
This length covers the expansion joint spacing and can also be bigger than the effective deformation length

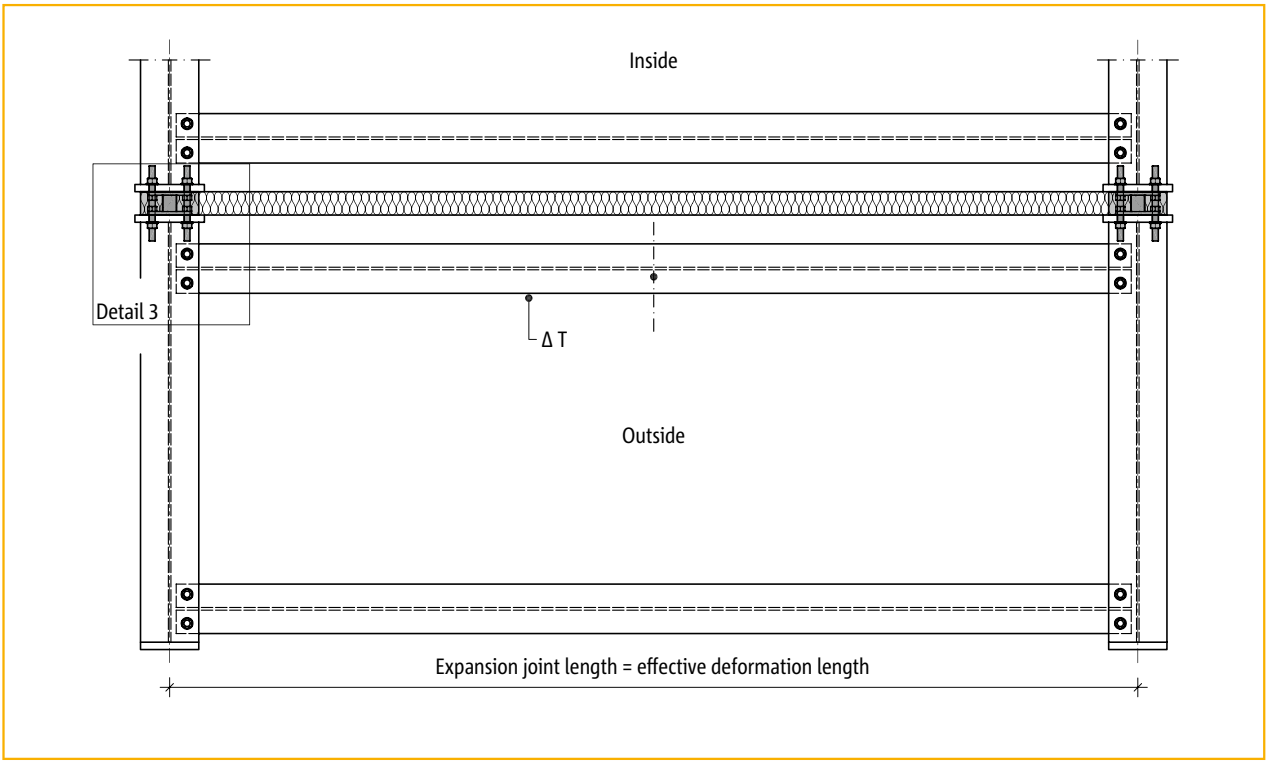
$L_{ex} \geq l_{eff}$

The permitted effective deformation length l_{eff} depends on
- the design of the on-site end plate (hole tolerances)
- the temperature collective
- the load reversals
- the stiffness of the exterior steel structure

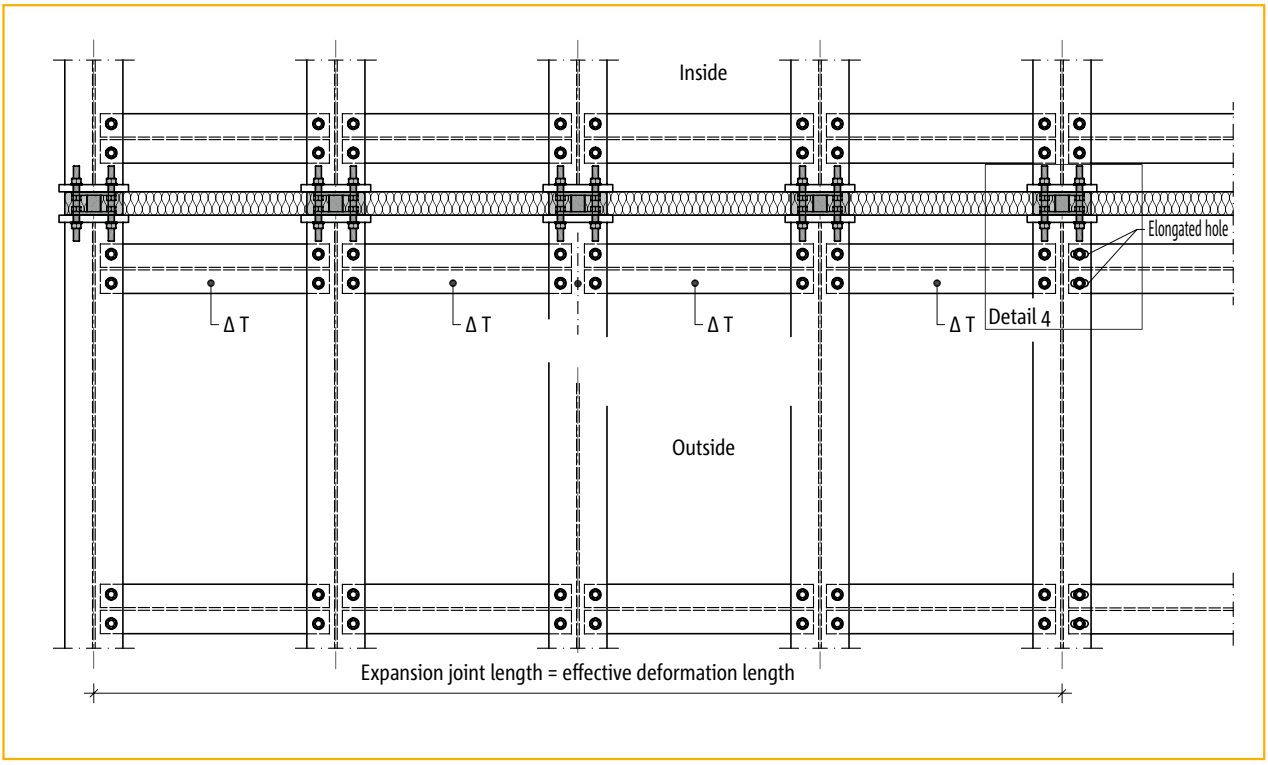
The definition and verification of these boundary condition lies with the EOR. Please feel free to contact our Canadian Design Department for further information.

Schöck Isokorb® type S22

Expansion joints/fatigue resistance



Schöck Isokorb® type S22 expansion joint spacing e zero movement point is between the fixed points



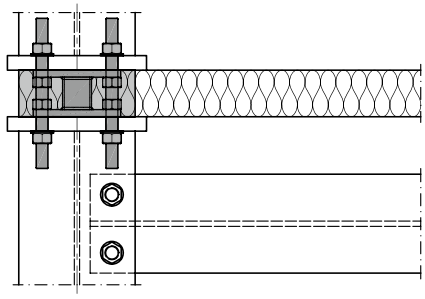
Schöck Isokorb® type S22 expansion joint spacing e zero movement point is at the most central fixed point

Schöck Isokorb® type S22
Expansion joints/fatigue resistance

Permitted effective deformation length l_{eff}

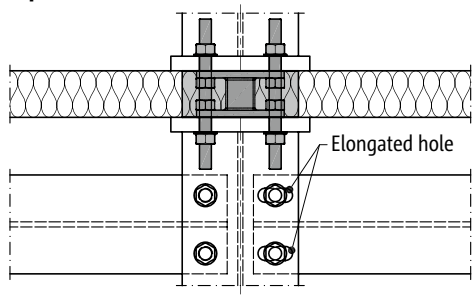
The Schöck Isokorb® is able to absorb temperature deformations of the exterior steel structure complying with an effective deformation length l_{eff} of up to 10.5m.
Based on a temperature difference of 70°C and a rigid steel structure, a hole tolerance of 2 mm is required. Concerning the load reversals and also for differing boundary conditions please feel free to contact our Schöck Design Department for further information.

Detail 3



Detail 3: Fixed attachment of secondary support structure to main support structure -> Pay attention to effective deformation length

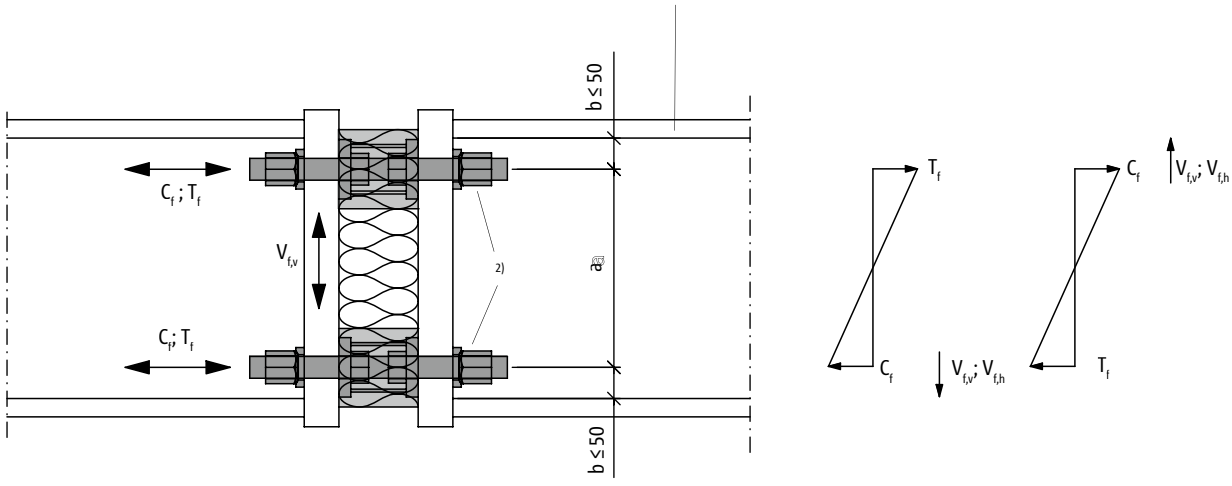
Detail 4



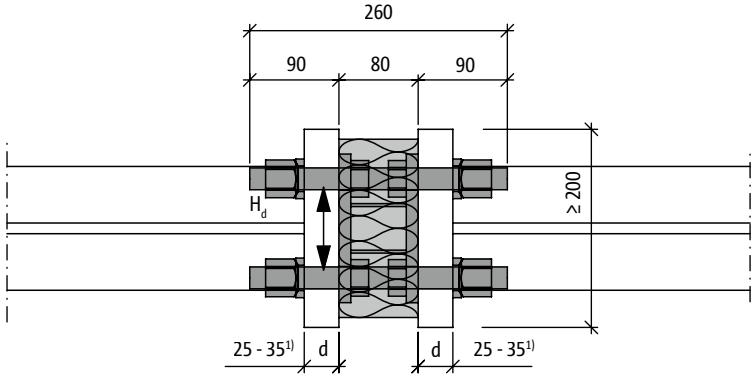
Detail 4: Expansion joint formation by means of slotted connection between secondary support structure and main support structure.

Schöck Isokorb® type S22
Design configuration

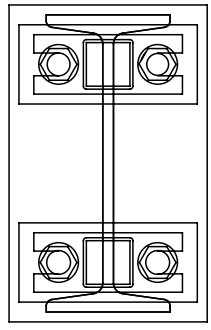
1 **Side elevation**



Plan elevation



Front elevation



Load-bearing capacity of the individual module:

S22	
$V_{r,h}$	6 kN[3)]
$V_{r,v}$	36 kN
T_r, C_r	225.4 kN

[3)] Always refer to the information about expansion joints/fatigue resistance on pages 109 - 111.

Schöck Isokorb® for connection of members with S22[2)]

Schöck Isokorb® type S22

Example of moment connections for W12 x 14 for lifting-off forces

Loads: Load case 1: $V_{f,v}$ = 25 kN $V_{f,h}$ = ±2 kN M_f = −15 kNm
Load case 2: $V_{f,v}$ = −25 kN $V_{f,h}$ = ±2 kN M_f = 15 kNm
a = 0.23 m

Verifications for S22 module

Shear force and horizontal force

$\frac{V_{f,v}}{V_{r,v}} < 1.0$ $\frac{V_{f,h}}{V_{r,h}} < 1.0$

$V_{f,v}/V_{r,v}$ = 25 kN/36 kN = 0.69 < 1.0
$V_{f,h}/V_{r,h}$ = 2 kN/6 kN = 0.33 < 1.0

Moment for load case 1

$\frac{C_f}{C_r} < 1.0$ $\frac{T_f}{T_r} < 1.0$

$C_f = T_f = M_f/a$ = - 15 kNm/0.231 m = 64.9 kN
C_f/C_r = 64.9 kN/225.4 kN = 0.29 < 1.0
T_f/T_r = 64.9 kN/225.4 kN = 0.29 < 1.0

Shear force and moment for load case 2 (uplift)

$\frac{V_{f,v}}{V_{r,v}} < 1.0$

$V_{f,v}/V_{r,v}$ = 25 kN/36 kN = 0.69 < 1.0

$\frac{C_f}{C_r} < 1.0$ $\frac{T_f}{T_r} < 1.0$

$C_f = T_f = M_f/a$ = 15 kNm/0.231 m = 64.9 kN

C_f/C_r = 64.9 kN/225.4 kN = 0.29 < 1.0
T_f/T_r = 64.9 kN/225.4 kN = 0.29 < 1.0

Interaction

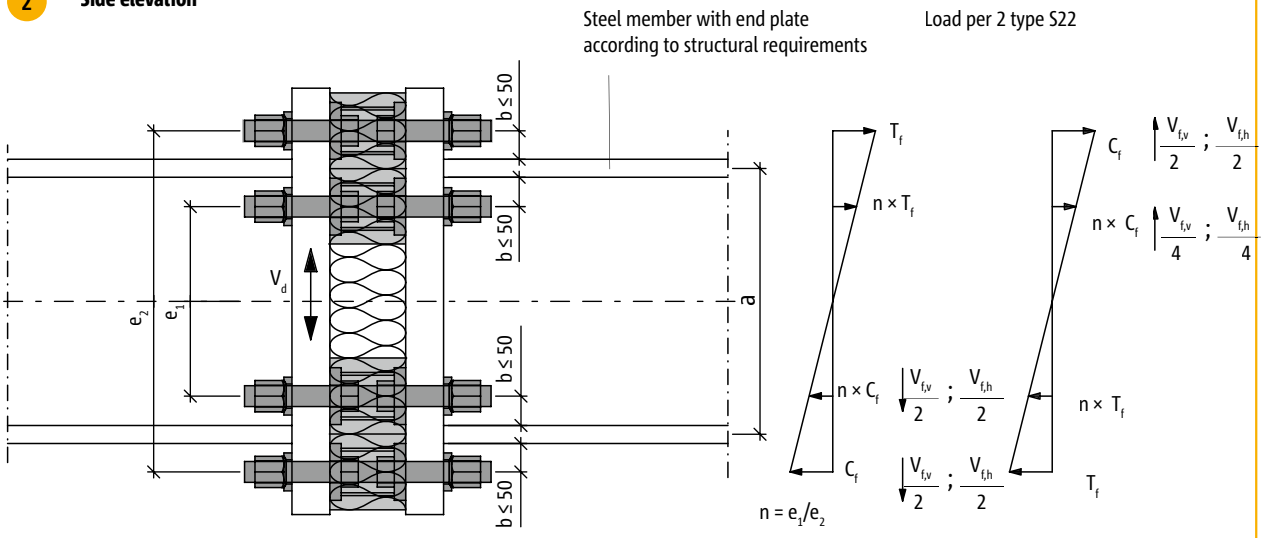
$3 \times V_{f,v} + 2 \times V_{f,h} + T_f \leq T_r$
3 × 25 + 2 × 2 + 64.9 = 143.9 ≤ 225.4

Notes

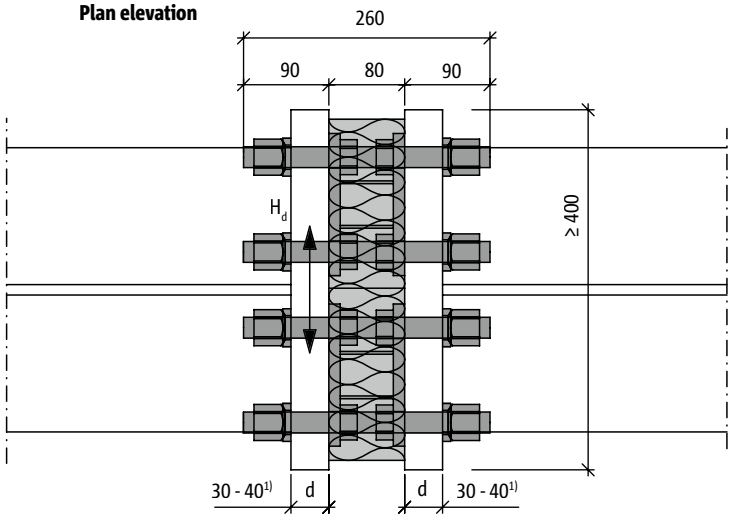
- As it cannot be ensured that the S22 modules establish a similarly large resistance to the resistance of shear forces at the same time, only the module which is located in the compressive area must be used to dissipate shear forces.

Schöck Isokorb® type S22
Design configuration

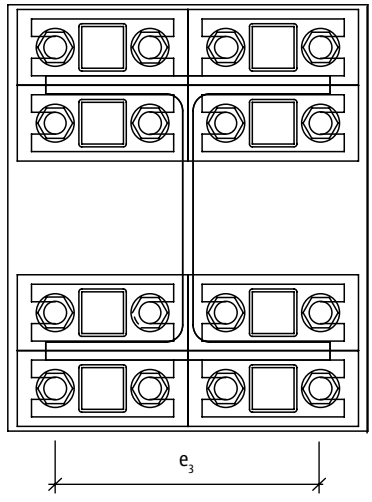
2 **Side elevation**



Plan elevation



Front elevation



Load-bearing capacity of the individual module:

S22	
$V_{r,h}$	6 kN[2)]
$V_{r,v}$	36 kN
T_r, C_r	225 kN

[2)] Always refer to the information about expansion joints/fatigue resistance on pages 109 - 111.

Schöck Isokorb® for connection of members with 8 S22 modules[2)]

Schöck Isokorb® module S22

Example of moment connection

Example: Moment connection for HEA 360 with 2 x 4 S22 modules

Loads:

Load case 1 (status during usage): $V_{f,v}$ = 126 kN $V_{f,h}$ = ±20 kN $M_{f,y}$ = −236 kNm

Load case 2 (assembly): $V_{f,v}$ = −96 kN $M_{f,y}$ = 166 kNm $M_{f,z}$ = ±22 kNm C_f = 160 kNm

e_1 = 0.215 m
e_2 = 0.450 m
e_3 = 0.280 m (axis separation of the outer row of bolts)

Verification of the load case "in operation":

Shear force and horizontal force at load case 1

$\frac{V_{f,v}}{V_{r,v}} < 1.0$ $\frac{H_d}{V_{r,h}} < 1.0$

$V_{r,v}$ = 4 × 36 kN = 144 kN
$V_{f,v}/V_{r,v}$ = 126 kN/144 kN = 0.88 < 1.0

$V_{r,h}$ = 4 × 6 kN = 24 kN
$V_{f,h}/V_{r,h}$ = 20 kN/24 kN = 0.83 < 1.0

Moment at load case 1

$M_{r,y} = 2 \times T_r \times e_2 + 2 \times \frac{e_1}{e_2} \times T_r \times e_1$

$C_f = T_f = \frac{M_{f,y}}{2 \times e_2 + 2 \times \frac{e_1}{e_2} e_1}$

$\frac{C_f}{C_r} < 1.0$ $\frac{T_f}{T_r} < 1.0$

Load per type S22

$\frac{236\ \text{KNm}}{2 \times 0.45\ \text{m} + 2 \times \frac{0.215\ \text{m}}{0.45\ \text{m}} 0.215\ \text{m}} = 213.5\ \text{KN}$

C_f/C_r = 213.5 KN/225.4 KN = 0.95 < 1.0
T_f/T_r = 213.5 KN/225.4 KN = 0.95 < 1.0

Deformation due to M_c (see page 107) resulting from unfactored loads

Buckling angle

$\varphi = \frac{M_k}{c}$ [rad]

$c = 24\,000 \times a^2$

$\varphi = \frac{236/1.45 \times 100}{25.5336^{06}}$ [rad]

$c = 24\,000 \times \left(\frac{(21.5\ \text{cm} + 45\ \text{cm})}{2} \right)^2 = 26.5335 \times 10^6$ [kNcm/rad]

Schöck Isokorb® type S22

Example type S22-QST 22 module, S22-ZQST 22 module

Loading combination during assembly:

Shear force at load case 2

$$\frac{V_{f,v}}{V_{r,v}} < 1.0$$

$V_{r,v} = 4 \times 36\ kN = 144\ kN$

$V_{f,v}/V_{r,v} = 96\ kN/144\ kN = 0.66 < 1.0$

Moment at load case 2 (uplift)

$$M_{f,y} = 2 \times C_f \times e_2 + 2 \times \frac{e_1}{e_2} \times C_f \times e_1$$

$$M_{f,z} = 2 \times C_f \times e_3$$

Verification of the bolts under the highest loads for compressive loads from bi-axial bending[1)]

$$\frac{C_f}{C_r} < 1.0$$

$$C_f = \frac{M_{f,y}}{2 \times e_2 + 2 \times \frac{e_1}{e_2} \times e_1} + \frac{M_{f,z}}{2^{1)} \times e_3} + \frac{C_f}{8^{2)}}$$

$$C_f = \frac{166\ KNm}{2 \times 0.45\ m + 2 \times \frac{0.215\ m}{0.450\ m} \times 0.215\ m} + \frac{22\ KNm}{2 \times 0.28\ m} + \frac{160\ KNm}{8}$$

$C_f = 150.17\ KN + 39.29\ KN + 20\ KN$

$C_f/C_r = 209.46\ KN/225.4\ KN = 0.93 < 1.0$

[1)] Conserevatively, only the external bolts are considered as being load-bearing. The calculations are performed with just 2 bolts, as C_f relates to 1 module.
[2)] Number of modules subjected to a compressive load due to normal force C_f.

Schöck Isokorb® type S22
End plate designing

Example - end plate protruding

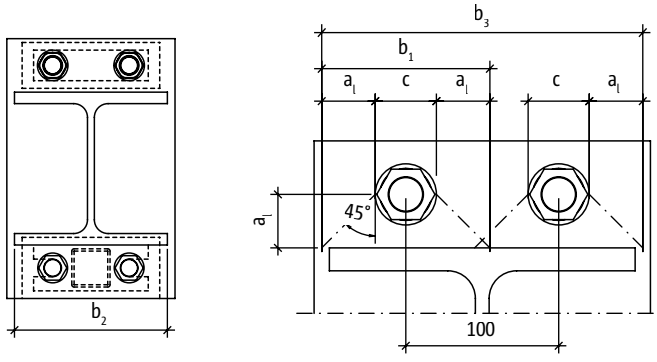
Calculation of max. bolt force: $\frac{T_{f,max}}{2} = T_{f,max}$ per bolt

Max. moment in the end plate:
$M_f = T_{f,max} \times a_l = [kNmm]$
$W = d^2 \times b_{ef}/6 = [mm^2]$ with

b_f = min (b_1; $b_2/2$; $b_3/2$)
d = thickness of end plate
c = diameter of U-washer
c (S22) = 39 mm

$b_1 = 2 \times a_l + c$ [mm]
b_2 = member width or width of end plate [mm]
$b_3 = 2 \times a_l + c + 100$ [mm]

$M_r = W \times f_{y,k}/1.1 = [kNmm]$
$M_f/M_r = \leq 1.0$



Schöck Isokorb® type S22 22 dimensioning of the end plate

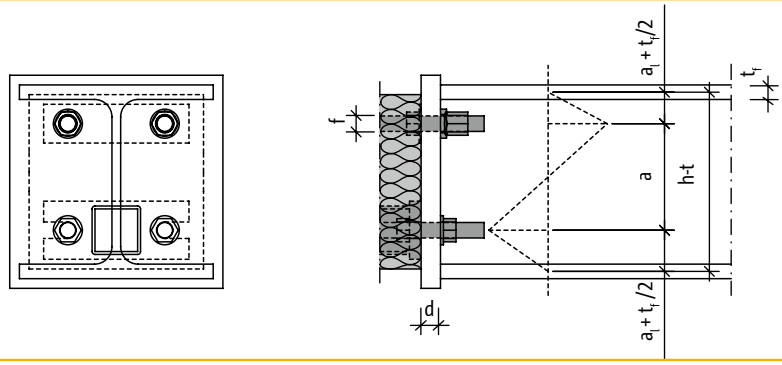
Example - end plate flush

Max. tensile or compressive force per module: $T_f = C_f$
Max. moment in the end plate: $M_f = T_f \times (a_l + \frac{t}{2})$

$W = d^2 \times b_{ef}/6$ with

$b_f = b - 2 \times f$
d = thickness of end plate
f = diameter of bolt hole
f (S22) = 24 mm
b = width of end plate

$M_r = W \times f_{y,k}/1.1$
$M_f/M_r = \leq 1.0$

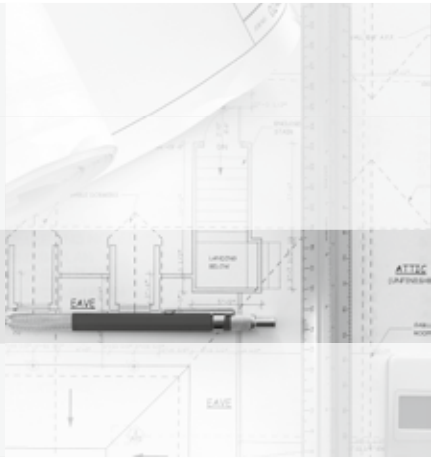


Schöck Isokorb® type S22 dimensioning of the end plate

Schöck Isokorb® type S22
Check list

- ☐ Have the member forces on the Isokorb® connection been determined at the design level?
- ☐ Will the Isokorb® element be used under primarily static loads?
- ☐ Are temperature deformations assigned directly to the Isokorb® connection? Expansion joint spacing?
- ☐ Will the Isokorb® connection be exposed to an environement with a high chlorine content (e.g. inside indoor swimming pools)?
- ☐ Is there a fire safety requirement for the overall load-bearing structure/Isokorb®?
- ☐ Calculation of the Isokorb® elements
  - Are the selected modules adequately dimensioned - refer to the “Design and calculation table” on page 106?
  - Is the interaction relationship $3 \times V_{f,v} + 2 \times V_{f,h} + T_f = \max T_f \leq Z_{x,Rd}$ satisfied for S22 under tensile loads with simultaneous shear loads?
- ☐ Did the deformation calculations for the overall structure take into account the deformation due to M_c in the Isokorb® connection?
- ☐ Have the tightening torques for the bolted connections been marked in the design drawings? The nuts should be tightened spanner-tight without planned preload; the following tightening torques apply:

  S22 (bolt ø 22 mm): $M_r = 80$ Nm



Schöck Isokorb® Structural Design
Design notes

Schöck Canada Enginering service

The technical details of a Schöck Isokorb® solution for a construction project are worked out by specialists at Schöck Canada. The basis of the design are the project documents that are provided and the product information in this technical manual.

The engineering service includes

- verification of correct geometry (slab depth on both sides of the gap, thermal break gap, concrete cover)
- verification of concrete compressive strength of the slabs being connected
- verification of yield strength of the flexural reinforcement in the slabs to which Isokorb's reinforcement will be lapped
- sizing flexural and shear reinforcement through the thermal break gap for the applied loads. The loads shall include: area, line and concentrated loads (dead & live) on the cantilever slab as well as any loads from façade elements bearing directly on the balcony slab, earthquake loads, wind loads, etc. which are provided by the engineer of record (EOR).
- design length of lap splices between Isokorb's reinforcement and that of the balcony slab and interior slab
- requirement verification/sizing of hoop ties for bursting stresses
- verification of deflections at tip of the exterior slab due to Schöck Isokorb®
- recommendation of any additional reinforcement required for crack control due to the stresses generated by the Isokorb® (bearing zone and edge conditions)

EOR responsibility

The responsibility for checking Schöcks recommendations about on-site measures such as cast-in-place reinforcement, expansion joint length and the determination of overall deformation lies with the EOR, and must be documented in the design drawings. For further details see the section entitled Products (section 3).

Schöck Isokorb® Structural Design
Architect/support structure planner

This design example should help to understand the calculations made by Schöck and check them with regard to the building design.

The planning of balconies with the Schöck Isokorb® takes place using the following procedure:

- Cantilever length => thickness of balcony slab
- Length of balcony -> Expansion joints required in balcony?
- Assume load
- Calculate bending moment
- Calculate shear force
- Select Schöck Isokorb® type
- Calculate deformation -> Specify camber
- Determine cast-in-place reinforcement
- Show Schöck Isokorb® in the drawings (item numbers)
- Show cross-section of Schöck Isokorb®

Required input from Architect/Structural Engineer

Schöck requires the following design information from the architect and structural engineer:

- Balcony cantilever length
- Overall length of balcony
- Height of balcony slab
- Required concrete covering CC = 40 mm
- Drainage direction + slope of top of balcony slab
- Concrete quality at interior slab side (e.g.: 25MPa)
- Concrete quality at balcony side (e.g.: 30MPa)

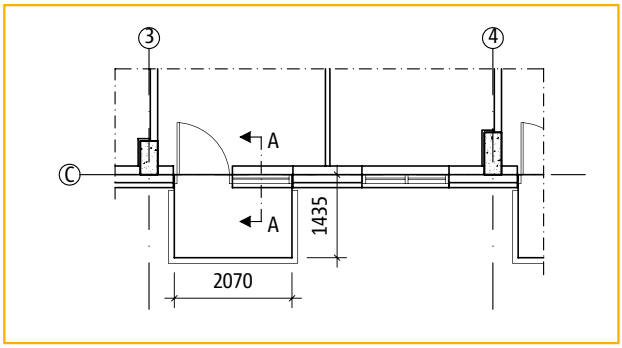


Figure 1: Building plan view

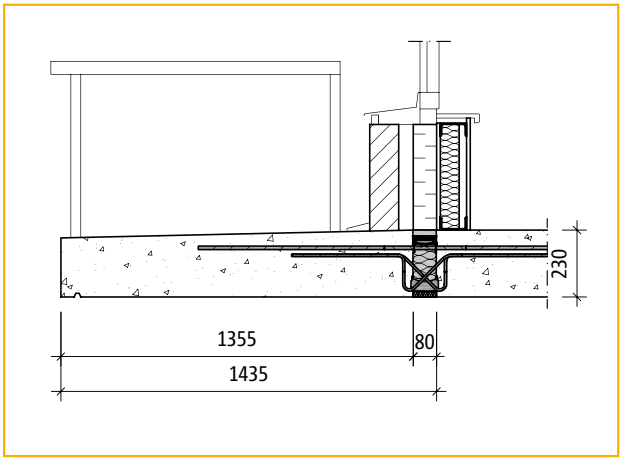


Figure 2: Building cross-section

Schöck Isokorb® Structural Design Example
Slab geometry

Selecting the Schöck Isokorb® height H

Schöck Isokorb® height H = 230 mm = slab thickness h
Concrete cover of Schöck Isokorb® CC55
Required concrete cover CC = 40 mm

Checking the balcony geometry

Minimum thickness of sloping balcony slab
Maximum slope of top of balcony slab 15/725 mm =2%

min $h_B = 230 - 0.02 \times 1355 = 202.9$
selected:
$h_{B1} = 215$ mm

Maximum cantilever length
max $\ell = 2460$ mm
=> max $\ell = 2460$ mm ≥ $\ell = 1535$ mm
(Table pg. 50 Technical Manual)

Recommended maximum balcony length
max $l_B = 1130$ mm
(expansion joint spacing)
(Drawing pg. 50 Technical Manual)

=> max $l_B = 1130$ mm ≥ $l_B = 2070$ mm

Possible connection length

Attention must be paid to the possible connection length. With a balcony length of 2070 mm it is 2000 mm (2 x Schöck Isokorb), 70 mm insulation must be arranged on site

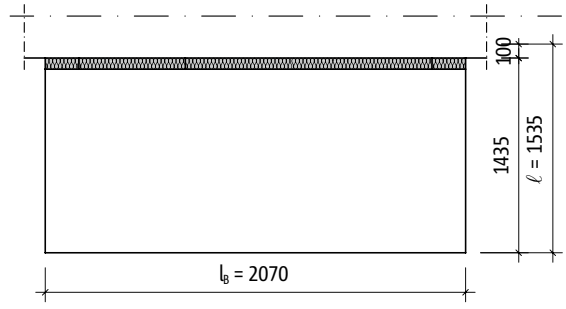


Figure 3: Overhead view of balcony

max ℓ [m] with Isokorb® height H [mm]					
190	**200**	**210**	**220**	**230**	**240**
2.10	2.25	2.39	2.54	2.68	2.83
1.88	2.03	2.17	2.32	2.46	2.61

Figure 5: Flexural slenderness table, page 50

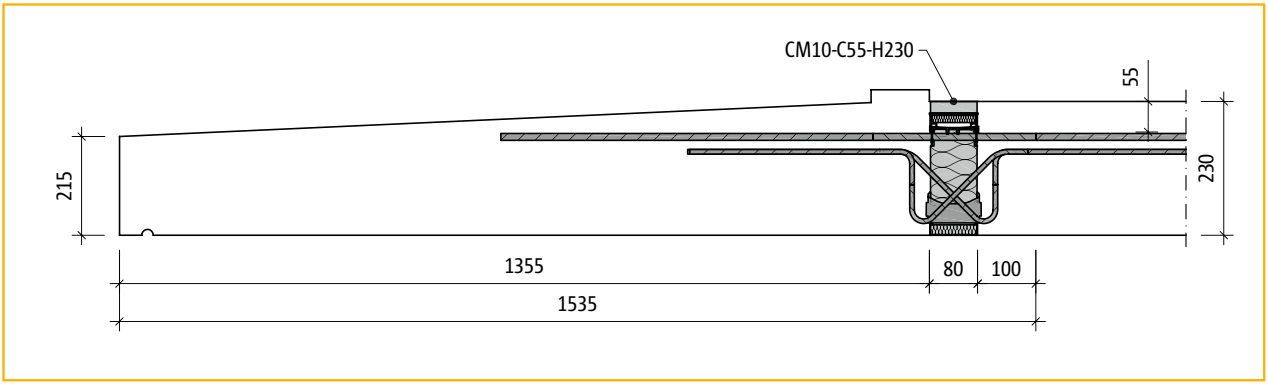


Figure 4: Cross-section through balcony

Schöck Isokorb® Structural Design Example
Verification at Ultimate Limit States

In this design example it has been assumed that the balcony is not put under stress by earthquakes or other horizontal loads.

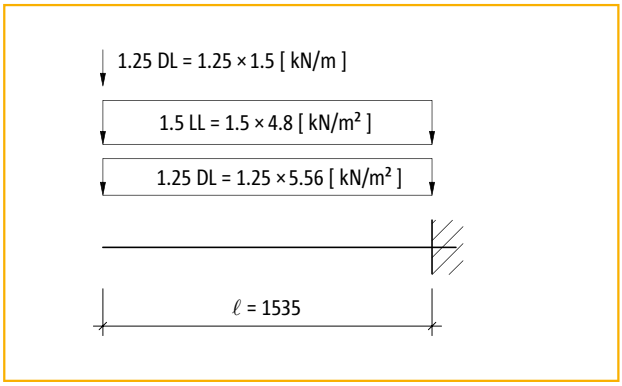


Figure 5: Static system

Choice of static system

Load:
Railing load (DL=1.5 kN/m)
Variable load (LL = 4.8 kN/m²)
Weight of balcony slab
(DL = 25 kN/m³ × 1m × 0.2225 = 5.56 kN/m²)
Dead Load Factor (DL) (DL) 1.25
Live Load Factor (LL) (LL) 1.5

Calculation of factored moment m_{Ed}
M_f = (-1.25 × (1.5 × 1.535 m + 5.56 × 1.535²/2) - 1.5 × 4.8 × 1.535² /2) × 2.07/2
M_f = - 20.23 kNm/m

Calculation of factored shear force v_{Ed}
V_f = (1.25 × (1.5 + 5.56 × 1.535) + 1.5 × 4.8 × 1.535) × 2.07/2
V_f = 24.43 kN/m

Select Schöck Isokorb® load capacity
(technical manual table page 54)

Concrete quality ≥30 MPa
H= 230 mm
CC = 55 mm

selected: CM10-CC55-H230
Maximum moment capacity
M_r = -30.2 kNm/m ≥ m_{Ed} = - 20.23 kNm/m
Maximum shear force capacity
V_r = 48.3 kN/m ≥ v_{Ed} = 24.43 kN/m

Schöck Isokorb® Structural Design Example
Verification at Serviceability Limit States

The Schöck engineer will only specify the additional deformation w_2 from the Schöck Isokorb. The EOR can calculate a camber taking the deformation of the slab w_1 and the angle of rotation of the interior slab into consideration.

Choice of static system deformation

Load:
Railing load (DL=1.5 kN/m)
Variable load (LL = 4.8 kN/m²)
Weight of balcony slab
(DL = 25 kN/m³ × 1 m × 0.2225 = 5.56 kN/m²)
Partial safety coefficient for permanent loads (DL) 1.0
Partial safety coefficient for variable loads (LL) 1.0

Calculation of unfactored moment M_n
M_n = - (1.5 × 1.535 m + 5.56 × 1.535² /2) – 1.0 × 4.8 × 1.535² /2) × 2.07/2.0
M_n = - 14.51 kNm/m

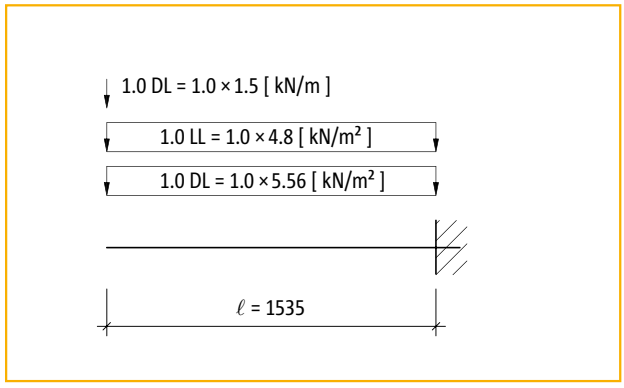


Figure 6: Static system deformation

Deformation due to Schöck Isokorb® w_2

$$w_2\,[\text{mm}] = \tan\alpha \times \ell \times \frac{M_n}{\frac{M_r}{1.4}} \times \frac{1}{100}$$

w_2 = 0.8 × 1.535 × (15.1/(30.2/1.4))* × 10
w_2 = 8.54 mm
The deformation details have a tolerance of ± 5 mm

Deformation factors tan α	Schöck Isokorb® type		
Concrete cover CC = 55 mm			
Isokorb height H [mm]	CM10	CM20	CM30
200	1.0	1.0	1.1
210	1.0	1.0	1.0
220	0.9	0.9	0.9
230	0.8	0.8	0.8
240	0.8	0.8	0.8
250	0.7	0.7	0.7

Figure: Deformation factor table (Page 55)

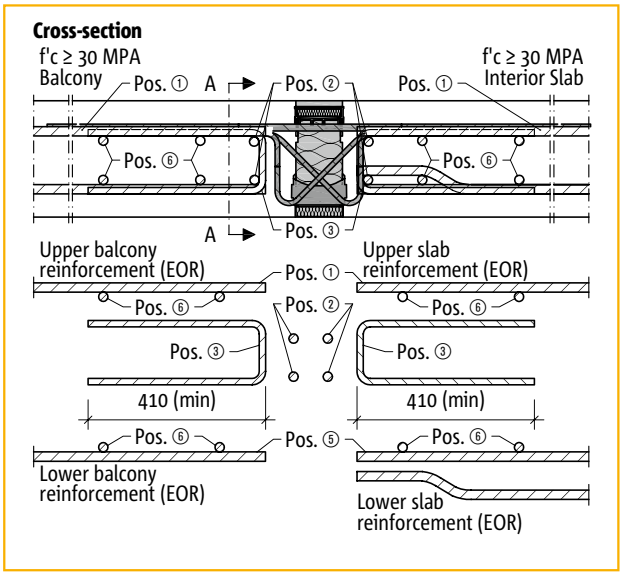
Schöck Isokorb® Structural Design
Cast-in-place reinforcement

Required cast-in-place reinforcement

The cast-in-place overlapping reinforcement is at least required to overlap the tension bars of the Schöck Isokorb®. The EOR must check whether the overlapping joint is also sufficient with regard to the required upper reinforcement position. (see pg. 56) The cast-in-place reinforcement is supplied by the building contractor.

Selected Schöck Isokorb®: CM10-CC55-H230

Pos 1 10M @ 140mm
Pos 2 4 x 10M
Pos 3 10M @ 300mm
Pos. 4 must be selected in accordance with the EOR specification, and is not shown by Schöck.



Cast-in-place reinforcement

Schöck Isokorb® type	CM10	CM20
Pos 1: Overlapping reinforcement		
Required cross-section area a_s [mm² / 1.0 m width]	680	910
Alternative 1	10M @ 140mm	10M @ 100
Alternative 2	15M @ 250mm	15M @ 200
Required lap splice length Pos.1		
Minimum [mm]	562	562
provided by Schöck Isokorb® [mm]	700	700
Pos 2: Longitudinal edge reinforcement		
Alternative 1	4 x 10M	4 x 10M
Alternative 2	4 x 15M	4 x 15M
Pos 3: U-Bars for the slab edges		
Alternative 1	10M @ 300mm	10M @ 300
Alternative 2	15M @ 350mm	15M @ 350
Pos 4: U-Bars for the free balcony edge		
Required cross-section area a_s [mm² / 1.0 m width]		In accordan
Pos 5: Reinforcement bottom layer		

Schöck Isokorb® Cast-in-place reinforcement

Schöck Isokorb® Structural Design
Representation in the installation plans

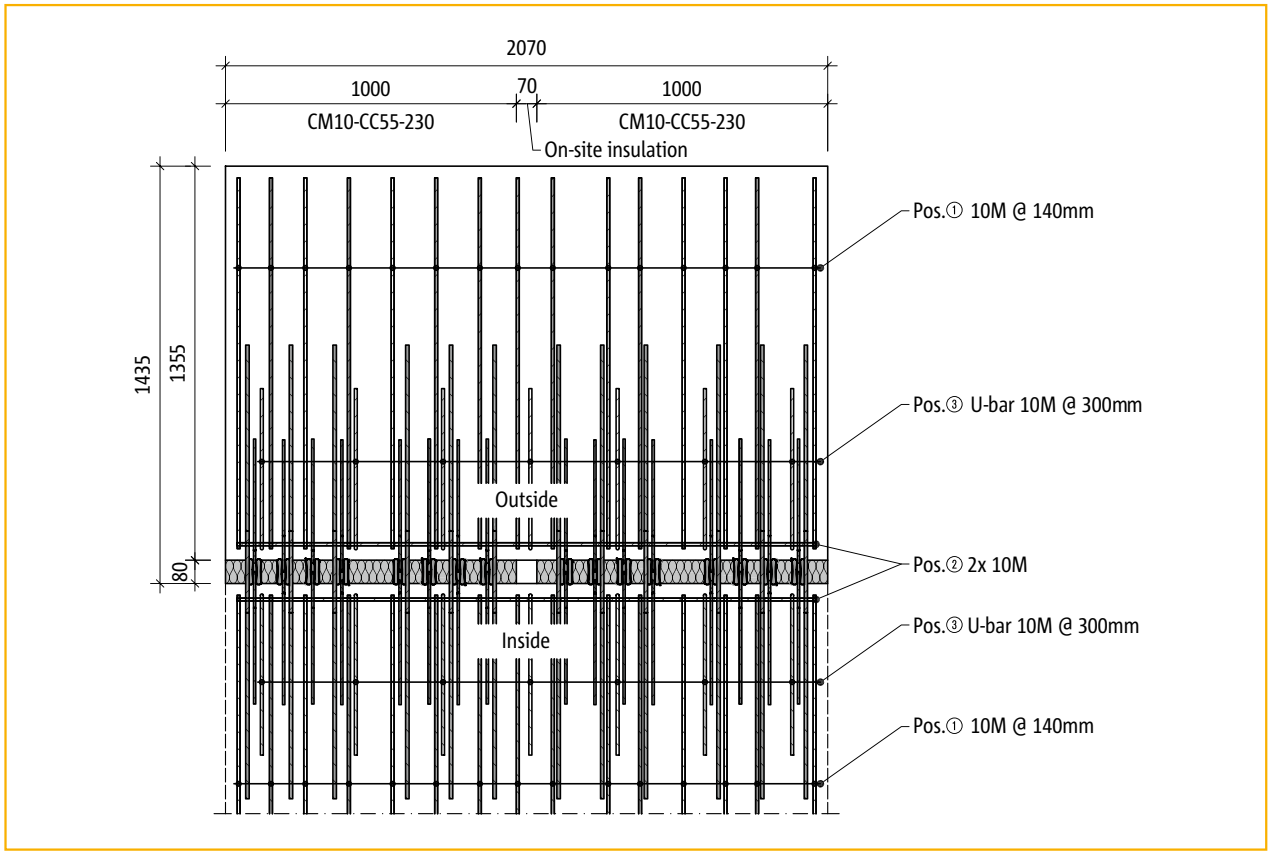


Figure 9: Overhead view of Schöck Isokorb®

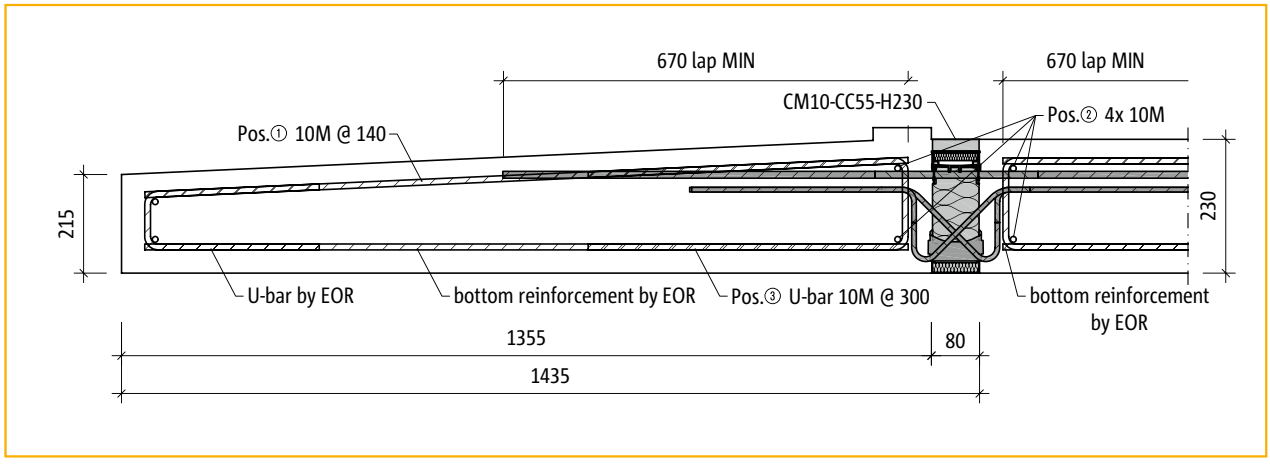
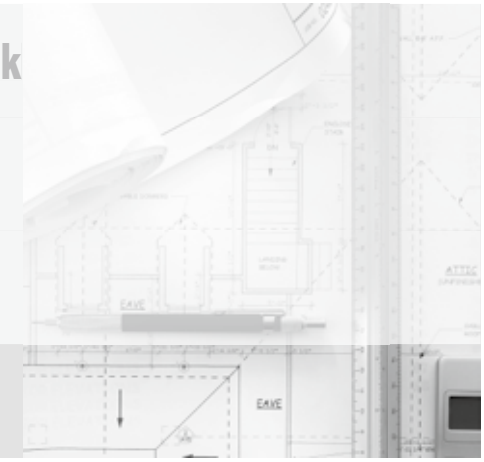
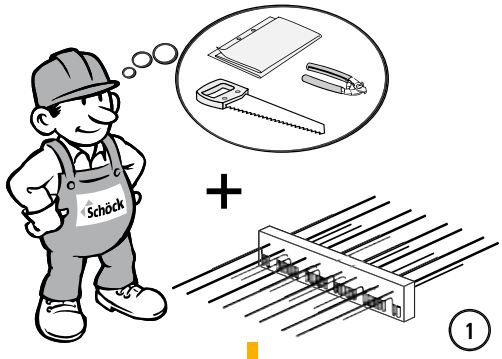
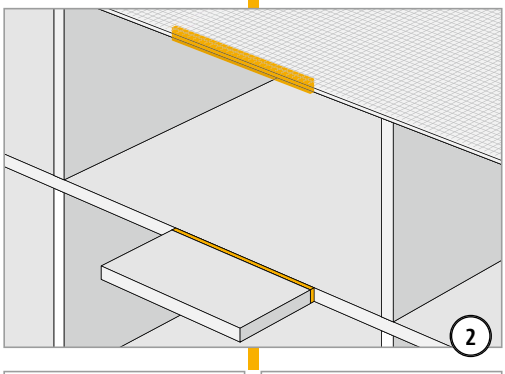


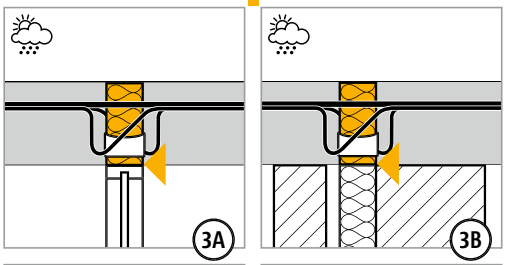
Figure 10: Cross-section of Schöck Isokorb®

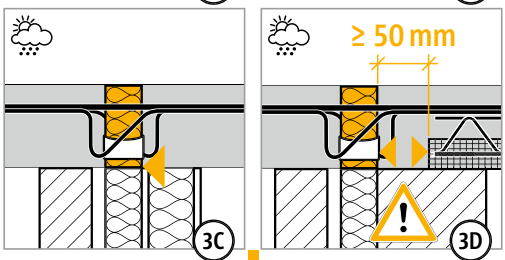


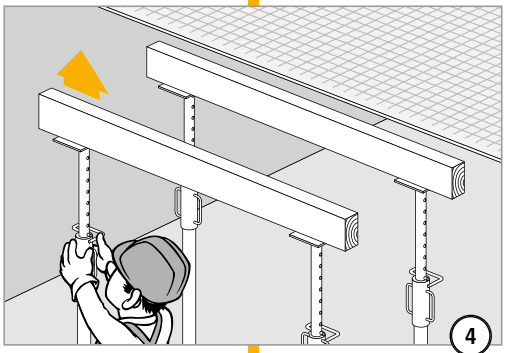
Schöck Isokorb® Type CM
Installation guideline

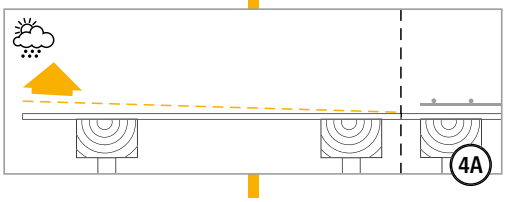












① + ②

- Check Schöck Isokorb® for damage and for consistency with design drawings.
- Check to ensure that the materials required to install Schöck Isokorb® for the construction project are complete.

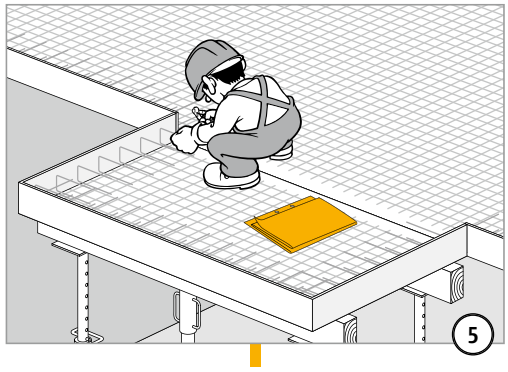
③ Ensure that Schöck Isokorb® is positioned according to the design drawings.

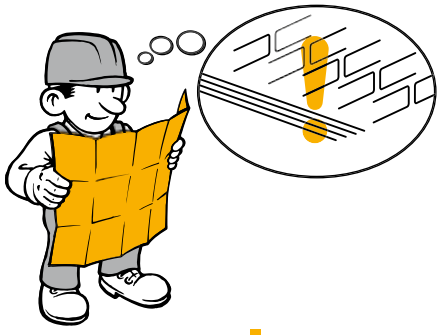
Image 3D – Installing Schöck Isokorb® with semi-finished component ceiling:

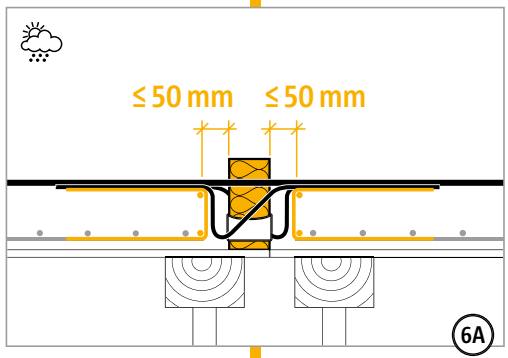
- Observing the dimensions for the pressure joint on the ceiling is of vital importance!
- A cast-in-place concrete strip must be placed between Schöck Isokorb® and the semi-finished part.
- The pressure joint must be filled and compacted properly when the concrete is placed.

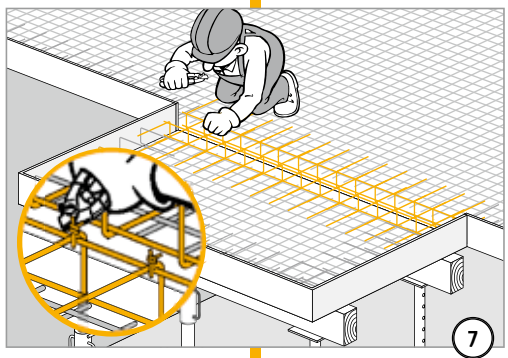
④ Check the slope of the balcony formwork according to the specifications provided by the structural engineer.

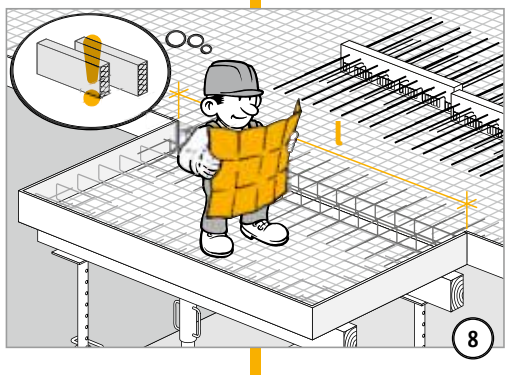
Schöck Isokorb® Type CM
Installation guideline









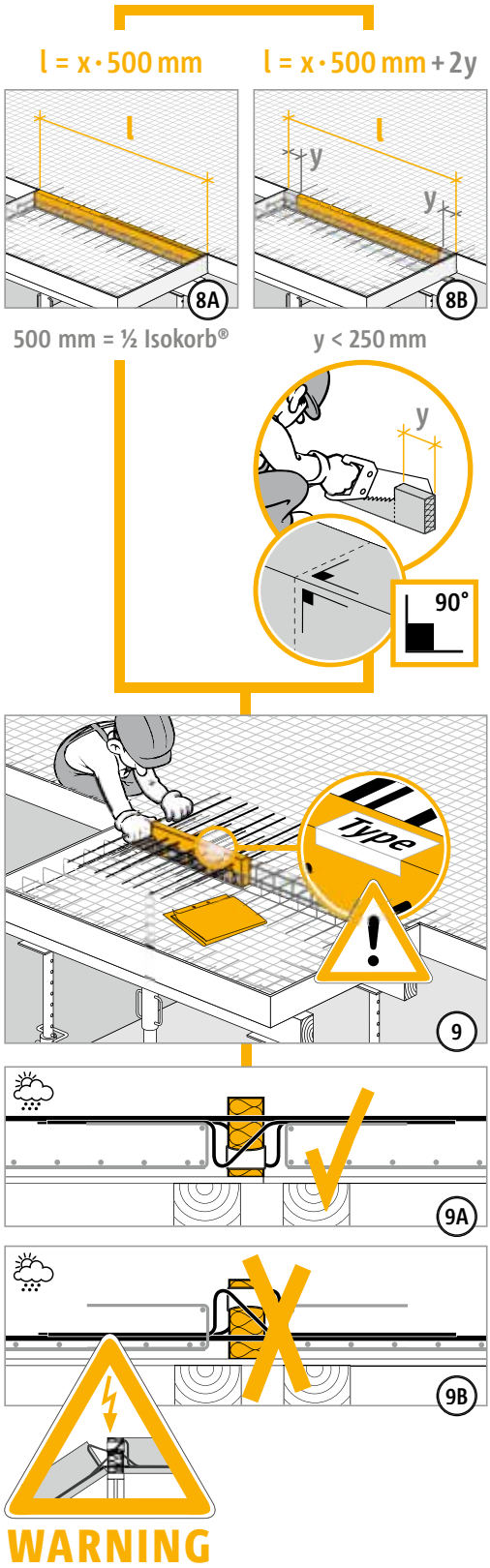


⑤ Install the lower slab reinforcement and edge brackets according to the reinforcement layout provided by the structural engineer.

⑥ + ⑦
Install connectors and longitudinal bars in the bracket corners along the Schöck Isokorb®.
Observe bar size and positioning of connectors and longitudinal bars as defined by the structural engineer, always a minimum of 10M.
Pay close attention to the spacing between connectors and Schöck Isokorb®.

⑧ Schöck Isokorb® must be installed as a full element (1000 mm) or a half element (500 mm) only! Please see the design drawings for Schöck Isokorb® positioning.

Schöck Isokorb® Type CM
Installation guideline



⑧ Image 8A – balcony length fits into the Schöck Isokorb® length grid: A remaining half Schöck Isokorb® can be used with other balconies of the same type and with the same load requirements.

Image 8B – balcony length does not fit into the Schöck Isokorb® length grid:
Thermal insulation strips are required on site in addition to Schöck Isokorb®. They must not exceed a length of 250 mm and may be installed at the edge of the balcony or between two Schöck Isokorb® components.
The thermal insulation strips should be in the same thermal conductivity class and have the same thickness as Schöck Isokorb®. Cut thermal insulation strips at a right angle on site.

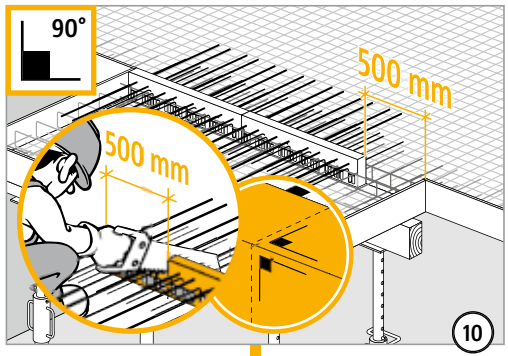
⑨ Before Schöck Isokorb® is installed, check its type designation against the design drawings for the respective balcony!

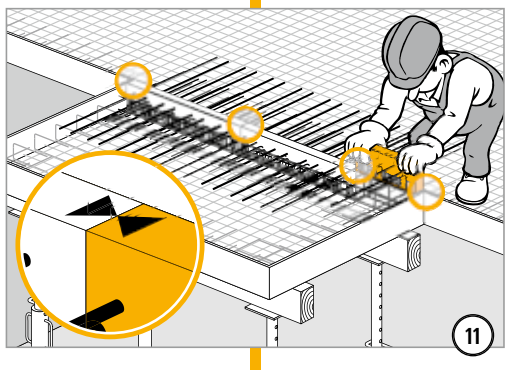
The following installation guidelines must be observed, otherwise exists danger to life!

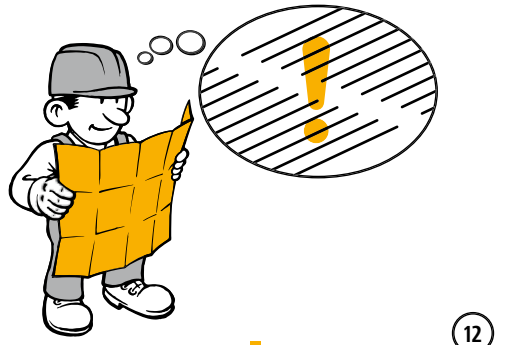
Image 9A – Always install the Schöck Isokorb® in the correct position. The TOP part of the Schöck Isokorb® is clearly marked as such and must be visible when installation is complete.

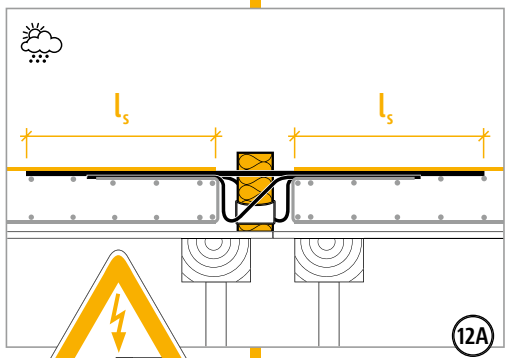
Image 9B – WARNING: If the Schöck Isokorb® is reserved and instead of the marking “TOP FACE” the marking “Bottom” is visible, then danger to materials and bodily injury may result. The Schöck Isokorb® will fail and the balcony may break off. This situation could result in death or serious unjury.

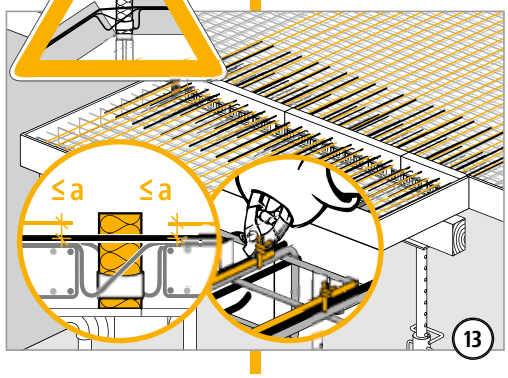
Schöck Isokorb® Type CM
Installation guideline











⑩ Install Schöck Isokorb® in a flush manner and at the correct height. Schöck Isokorb® must be cut at a right angle and exactly at mid-length.

⑪ Joints between Schöck Isokorb® components and adjacent thermal insulation strips or edge connections must be tight.

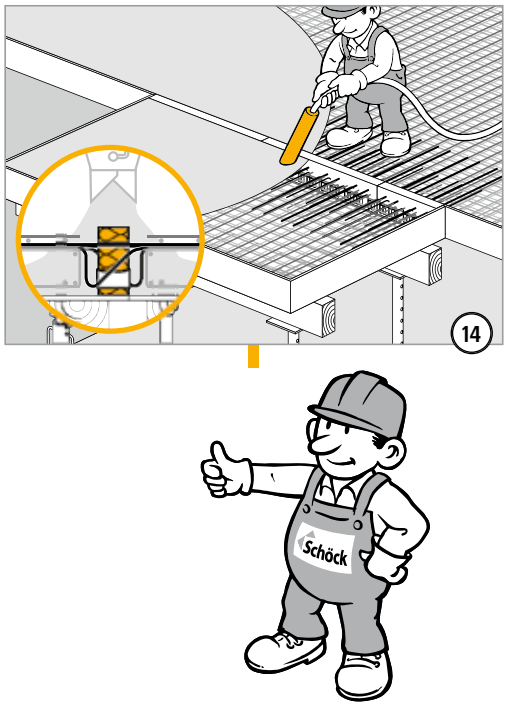
⑫ Ensure that the reinforcement required on site according to the design drawings provided by the structural engineer is complete.

Image 12A - Install the overlapping reinforcement on both sides of the Schöck Isokorb® component with bar steel ≥ 10M.

WARNING: Without the overlapping reinforcement added on site, Schöck Isokorb® may no longer be functional, which can lead to the balcony slab breaking off. Mortal endangering construction personnel and the public collapse.

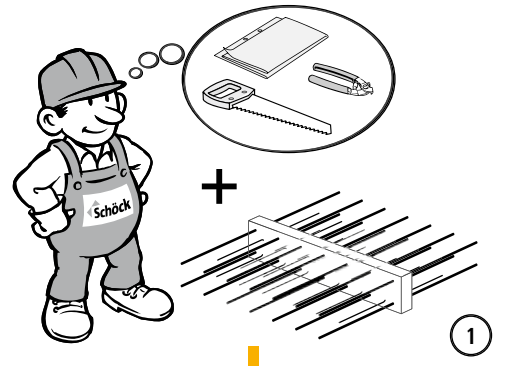
⑬ Properly connect the overlapping reinforcement with the Schöck Isokorb® tension bars on site. Maintain a ≤ 0,2 x l_s distance between the overlapping reinforcement and the Schöck Isokorb® tension bar.

Schöck Isokorb® Type CM
Installation guideline

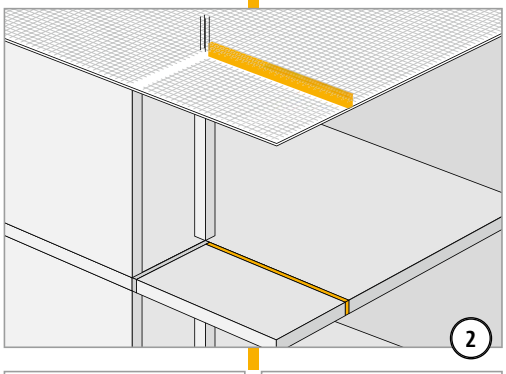


⑭ Before placing the concrete, check the alignment and connecting reinforcement of Schöck Isokorb® as well as the concrete cover. To keep the Schöck Isokorb® component in place, ensure that the concrete is filled and compacted evenly on both sides.

Schöck Isokorb® Type CMD
Installation guideline



1



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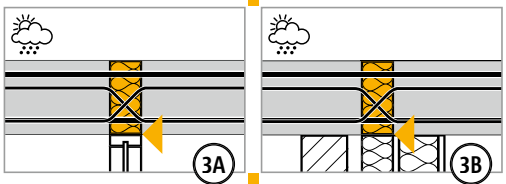
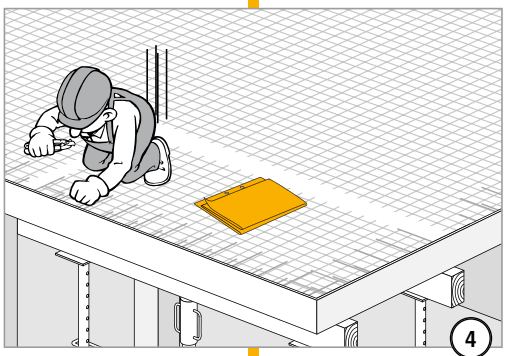


3A 3B



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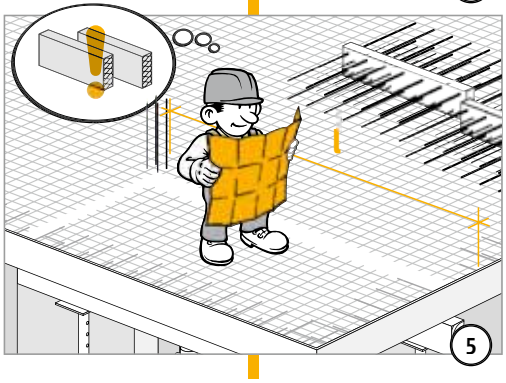


5

① + ②

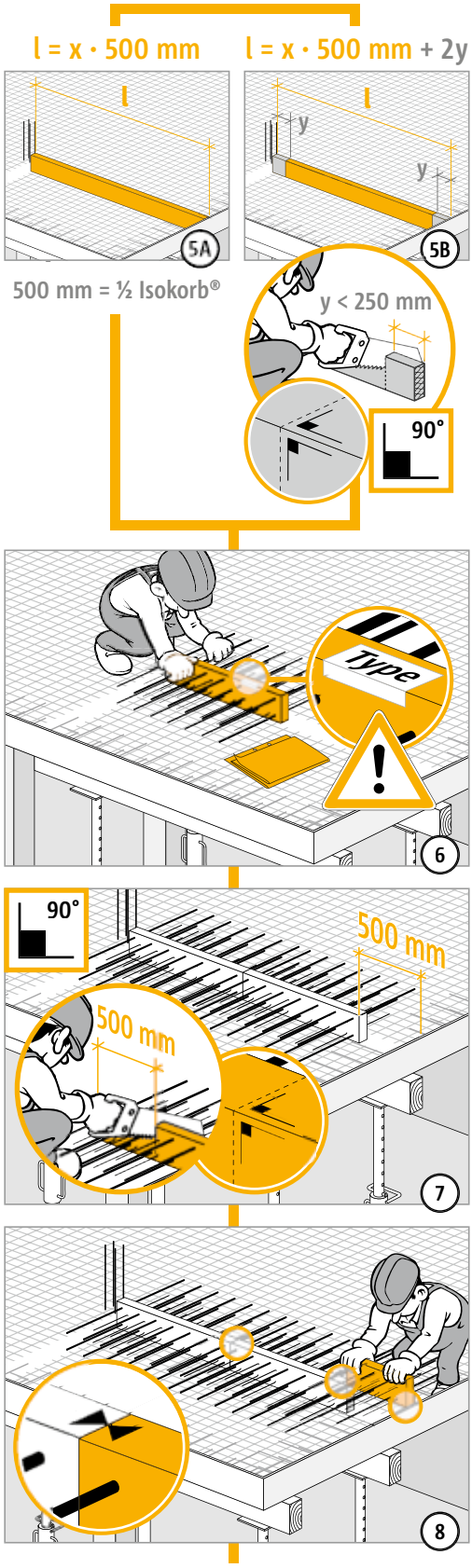
- Check Schöck Isokorb® for damage and for consistency with design drawings.
- Check to ensure that the materials required to install Schöck Isokorb® for the construction project are complete.

③ Ensure that Schöck Isokorb® is positioned according to the design drawings.

④ Install the lower slab reinforcement and edge brackets according to the reinforcement layout provided by the structural engineer.

⑤ Schöck Isokorb® must be installed as a full element (1000 mm) or a half element (500 mm) only! Please see the design drawings for Schöck Isokorb® positioning.

Schöck Isokorb® Type CMD
Installation guideline



⑤ Image 5A: balcony length fits into the Schöck Isokorb® length grid: A remaining half Schöck Isokorb® can be used with other balconies of the same type and with the same load requirements.

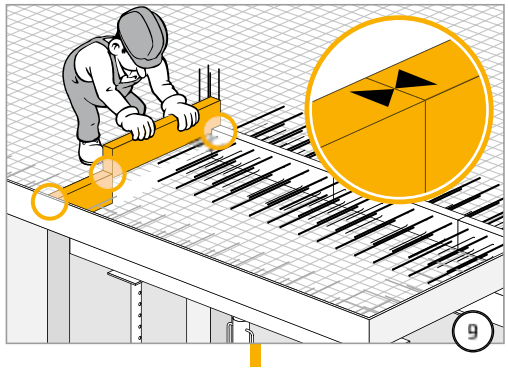
Image 5B: balcony length does not fit into the Schöck Isokorb® length grid:
Thermal insulation strips are required on site in addition to Schöck Isokorb®. They must not exceed a length of 250 mm and may be installed at the edge of the balcony or between two Schöck Isokorb® components.
The thermal insulation strips should be in the same thermal conductivity class and have the same thickness as Schöck Isokorb®. Cut thermal insulation strips at a right angle on site.

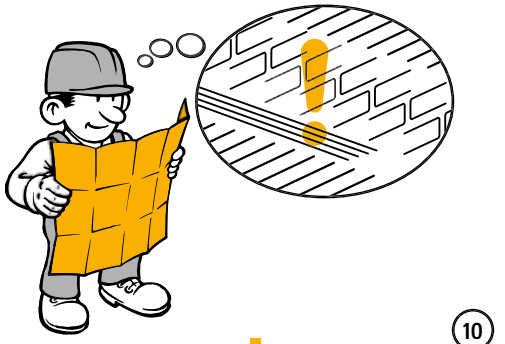
⑥ Before Schöck Isokorb® is installed, check its type designation against the design drawings for the respective balcony!

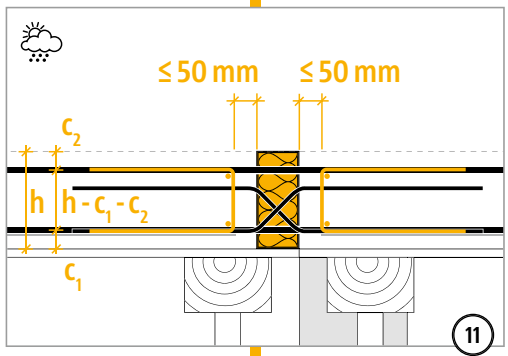
⑦ Install Schöck Isokorb® in a flush manner and at the correct height. Schöck Isokorb® must be cut at a right angle and exactly at mid-length.

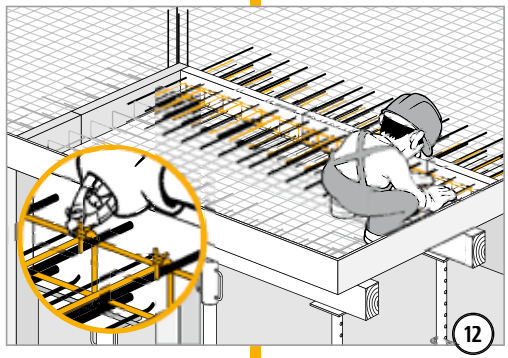
⑧ Joints between Schöck Isokorb® components and adjacent thermal insulation strips or edge connections must be tight.

Schöck Isokorb® Type CMD
Installation guideline









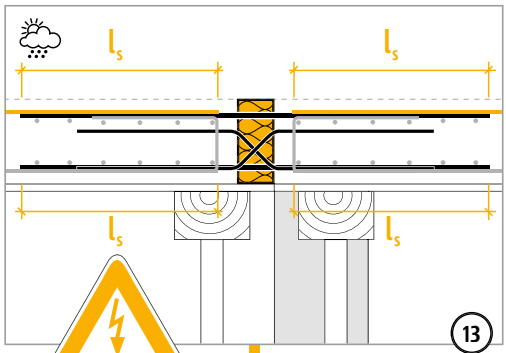
⑨ Install the thermal insulation strips on site according to the design drawings. Joints between the thermal insulation strips and at edge connections must be tight.

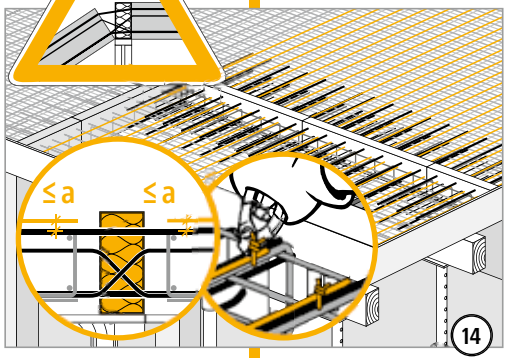
⑩ Ensure that the reinforcement required on site according to the design drawings provided by the structural engineer is complete.

⑪ Install connectors and longitudinal bars in the bracket corners along the Schöck Isokorb®.
Observe bar size and positioning of connectors and longitudinal bars as defined by the structural engineer, always a minimum of 10M.
Pay close attention to the spacing between connectors and Schöck Isokorb®.

⑫ Properly connect the reinforcement with Schöck Isokorb® on site.

Schöck Isokorb® Type CMD
Installation guideline





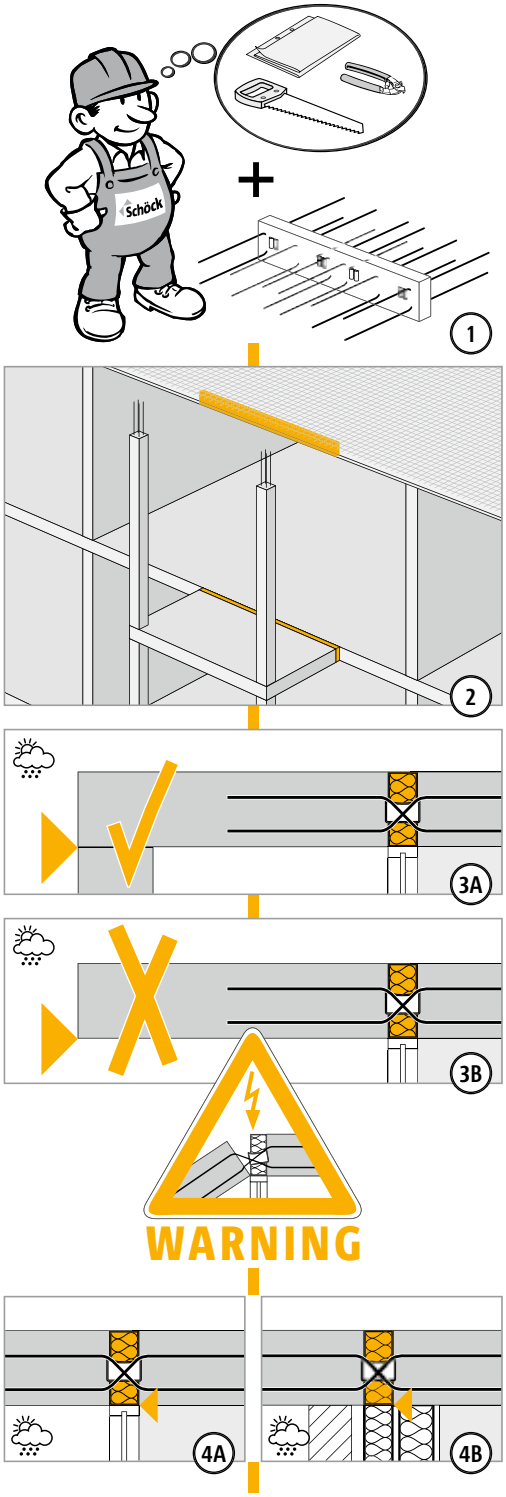
⑬ Install the overlapping reinforcement on both sides of the Schöck Isokorb® component with bar steel ≥ 10M.

▶ WARNING: Without the overlapping reinforcement added on site, Schöck Isokorb® may no longer be functional, which can lead to the balcony slab breaking off. This situation could result in death or serious unjury.

⑭ Properly connect the overlapping reinforcement with the Schöck Isokorb® tension bars on site.
Maintain a ≤ 0,2 x l_s distance between the overlapping reinforcement and the Schöck Isokorb® tension bar.

⑮ Before placing the concrete, check the alignment and connecting reinforcement of Schöck Isokorb® as well as the concrete cover. To keep the Schöck Isokorb® component in place, ensure that the concrete is filled and compacted evenly on both sides.

Schöck Isokorb® Type CV
Installation guideline



① + ②

- Check Schöck Isokorb® for damage and for consistency with design drawings.
- Check to ensure that the materials required to install Schöck Isokorb® for the construction project are complete.

③ The following installation guidelines must be observed!

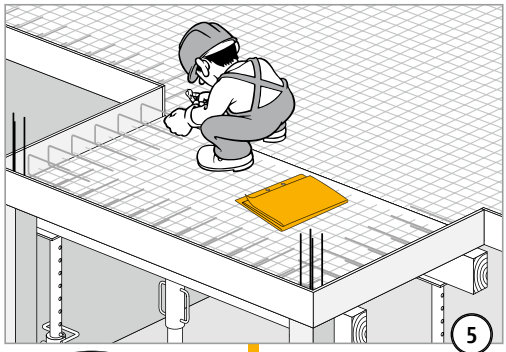
Image 3A:
Schöck Isokorb® Type CV must only be installed in supported balcony structures.

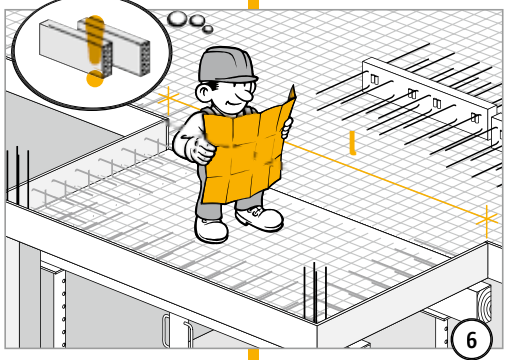
Image 3B:

- WARNING: If Schöck Isokorb® Type CV is used for free cantilevered balcony structures, Schöck Isokorb® is no longer functional, which will lead to the balcony slab breaking off. Mortal endangering construction personnel and the public!
  For free cantilevered balcony structures, use Schöck Isokorb® Type CM instead!

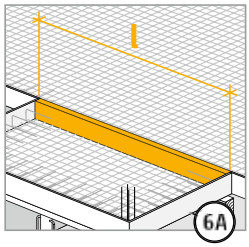
④ Ensure that Schöck Isokorb® is positioned according to the design drawings.

Schöck Isokorb® Type CV
Installation guideline



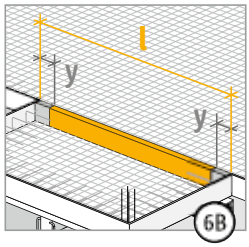


l = x · 500 mm

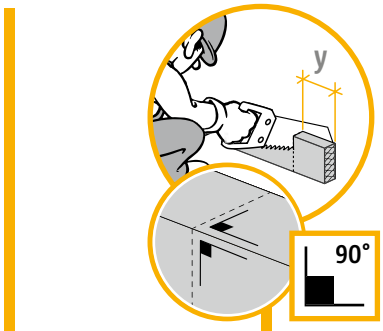


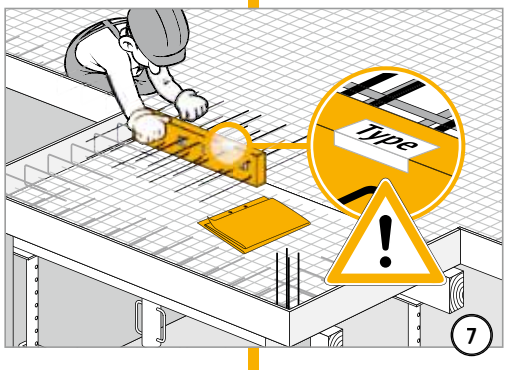
500 mm = ½ Isokorb®

l = x · 500 mm + 2y



y < 250 mm





⑤ Install the lower slab reinforcement and edge brackets according to the reinforcement layout provided by the structural engineer.

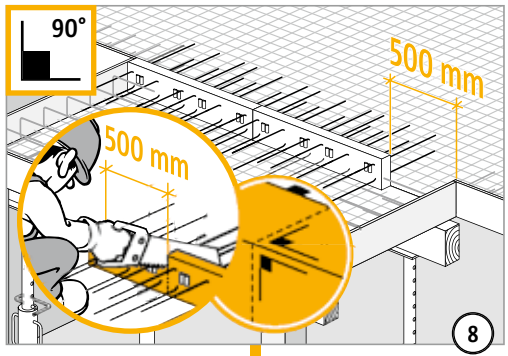
⑥ Schöck Isokorb® must be installed as a full element (1000 mm) or a half element (500 mm) only! Please see the design drawings for Schöck Isokorb® positioning.

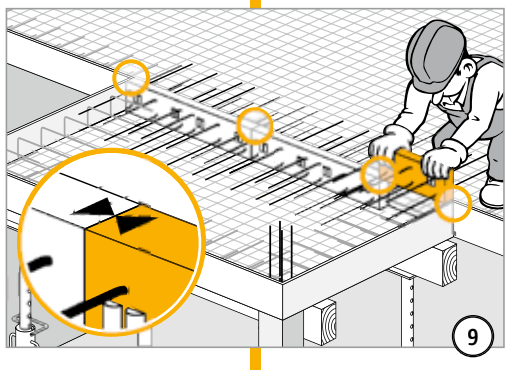
Image 6A: balcony length fits into the Schöck Isokorb® length grid: A remaining half Schöck Isokorb® can be used with other balconies of the same type and with the same load requirements.

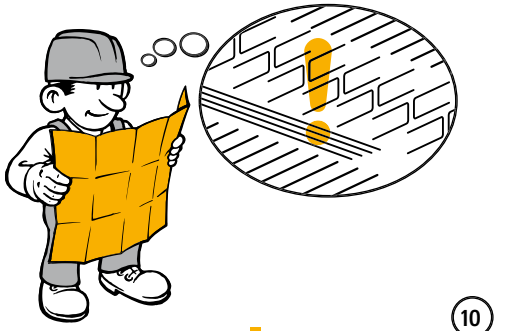
Image 6B: balcony length does not fit into the Schöck Isokorb® length grid:
Thermal insulation strips are required on site in addition to Schöck Isokorb®. They must not exceed a length of 250 mm and may be installed at the edge of the balcony or between two Schöck Isokorb® components.
The thermal insulation strips should be in the same thermal conductivity class and have the same thickness as Schöck Isokorb®. Cut thermal insulation strips at a right angle on site.

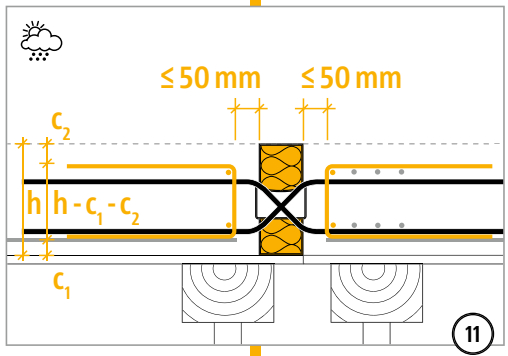
⑦ Before Schöck Isokorb® is installed, check its type designation against the design drawings for the respective balcony!

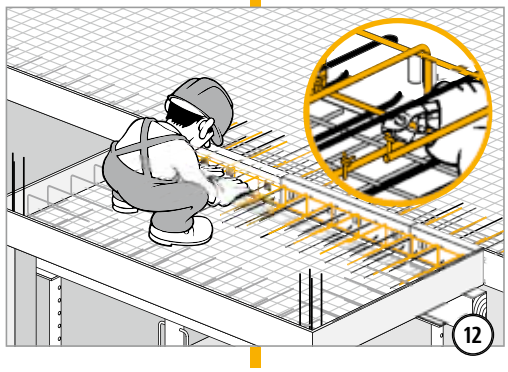
Schöck Isokorb® Type CV
Installation guideline











⑧ Install Schöck Isokorb® in a flush manner and at the correct height. Schöck Isokorb® must be cut at a right angle and exactly at mid-length.

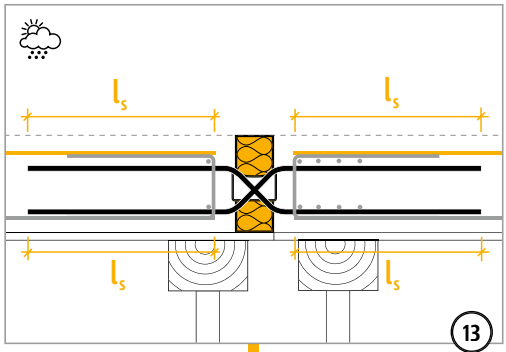
⑨ Joints between Schöck Isokorb® components and adjacent thermal insulation strips or edge connections must be tight.

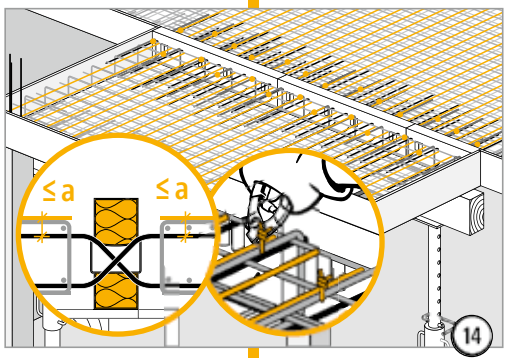
⑩ Ensure that the reinforcement required on site according to the design drawings provided by the structural engineer is complete.

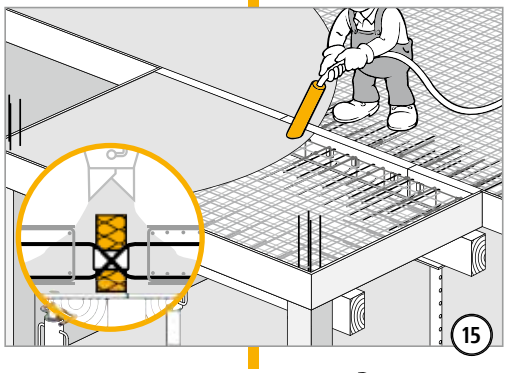
⑪ Install connectors and longitudinal bars in the bracket corners along the Schöck Isokorb®.
Observe bar size and positioning of connectors and longitudinal bars as defined by the structural engineer, always a minimum of 10M.
Pay close attention to the spacing between connectors and Schöck Isokorb®.

⑫ Properly connect the reinforcement with the Schöck Isokorb® tension bars on site.

Schöck Isokorb® Type CV
Installation guideline





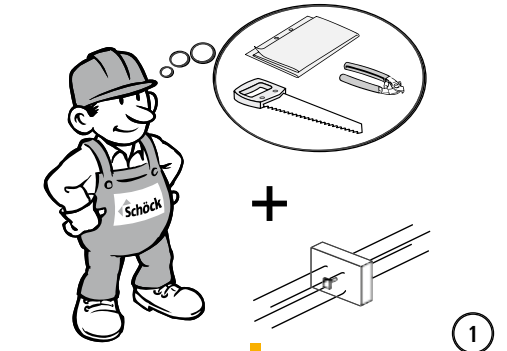


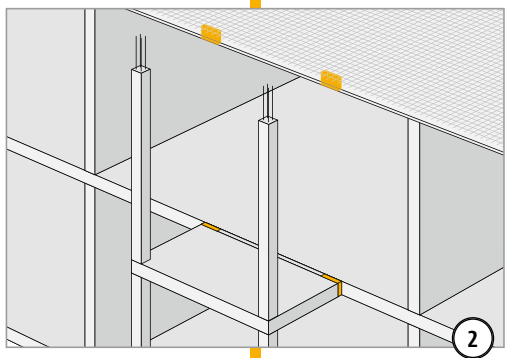
⑬ Install the upper slab reinforcement according to the reinforcement layout provided by the structural engineer.

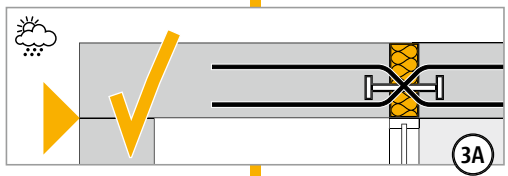
⑭ Properly connect the upper slab reinforcement with the Schöck Isokorb® tension rods on site.
Maintain a = distance between the overlapping reinforcement and the Schöck Isokorb® tension rod specified in the design drawings.

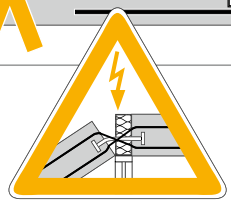
⑮ Before placing the concrete, check the alignment and connecting reinforcement of Schöck Isokorb® as well as the concrete cover.
To keep the Schöck Isokorb® component in place, ensure that the concrete is filled and compacted evenly on both sides.

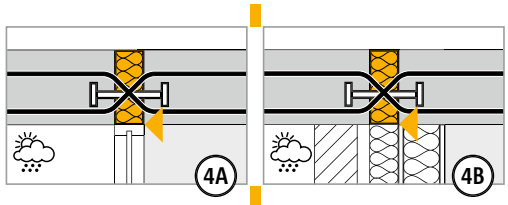
Schöck Isokorb® Type CVB
Installation guideline

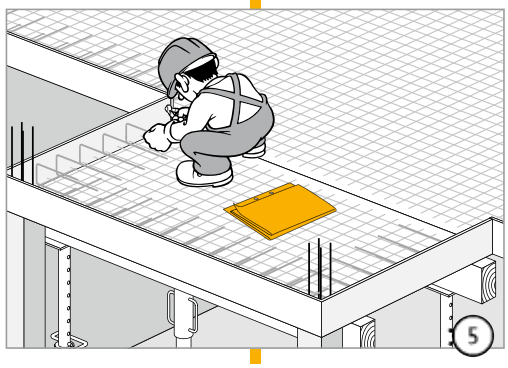












① + ②

- Schöck Isokorb® for damage and for consistency with design drawingsd.
- Check to ensure that the materials required to install Schöck Isokorb® for the construction project are complete.

③ The following installation guidelines must be observed!

Image 3A:
Schöck Isokorb® Type CVB must only be installed in supported balcony structures.

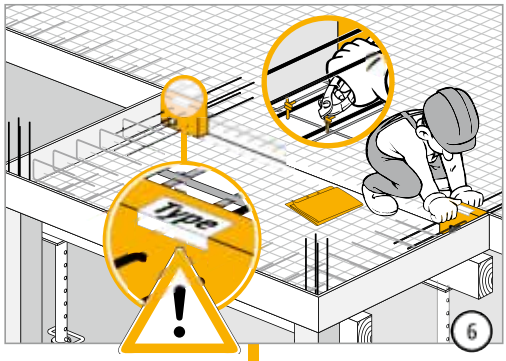
Image 3B:

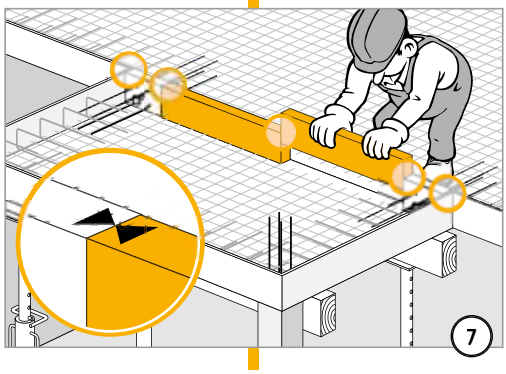
- WARNING: If Schöck Isokorb® Type CVB is used for free cantilevered balcony structures, Schöck Isokorb® is no longer functional, which will lead to the balcony slab breaking off. This situation could result in death or serious unjury.
- For free cantilevered balcony structures, use Schöck Isokorb® Type CM instead!

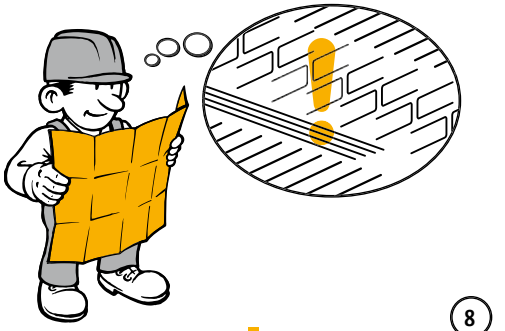
④ Ensure that Schöck Isokorb® is positioned according to the design drawings.

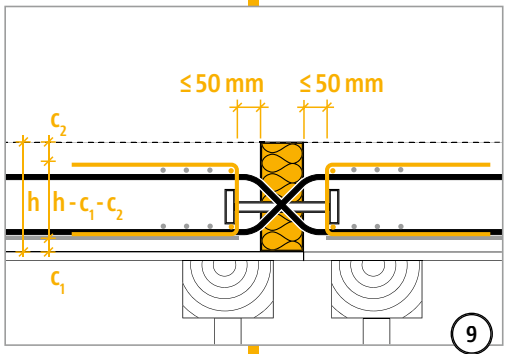
⑤ Install the lower slab reinforcement and edge brackets according to the design drawings provided by the structural engineer.

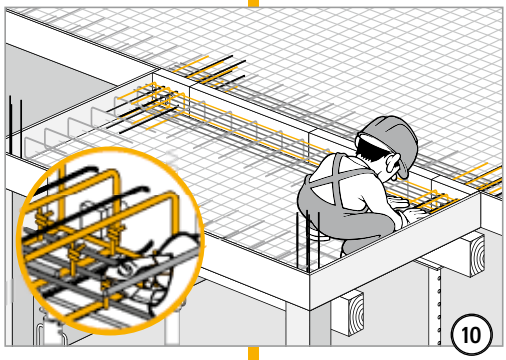
Schöck Isokorb® Type CVB
Installation guideline











⑥ Before Schöck Isokorb® is installed, check its type designation against the design drawings for the respective balcony!

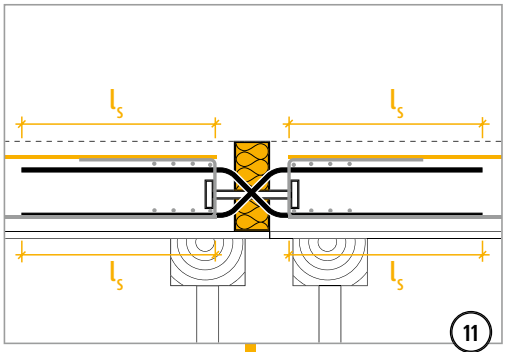
⑦ Install the thermal insulation strips between the Schöck Isokorb® components according to the implementation plan.
Joints between Schöck Isokorb® components and adjacent thermal insulation strips or edge connections must be tight.

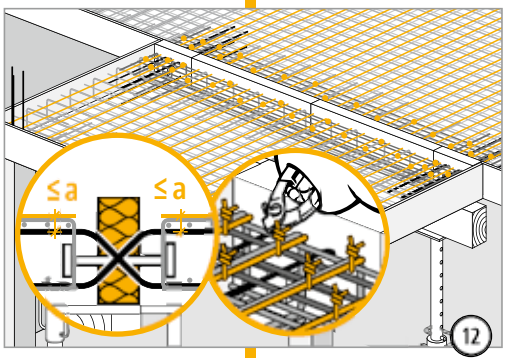
⑧ Ensure that the reinforcement required on site according to the design drawings provided by the structural engineer is complete.

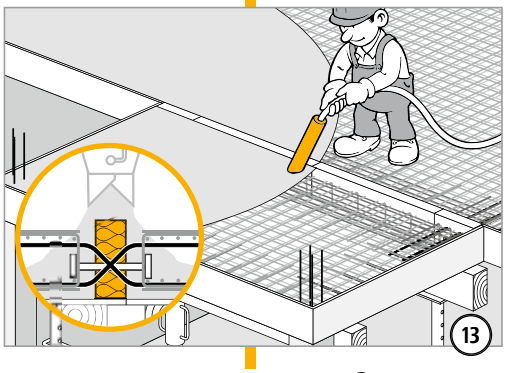
⑨ Install connectors and longitudinal bars in the bracket corners along the Schöck Isokorb®.
Observe bar size and positioning of connectors and longitudinal bars as defined by the structural engineer, always a minimum of 10M.
Pay close attention to the spacing between connectors and Schöck Isokorb®.

⑩ Properly connect the reinforcement with the Schöck Isokorb® tension rods on site.
Install the longitudinal bars (minimum 10M) from Schöck Isokorb® to Schöck Isokorb® along the entire length of the balcony.

Schöck Isokorb® Type CVB
Installation guideline





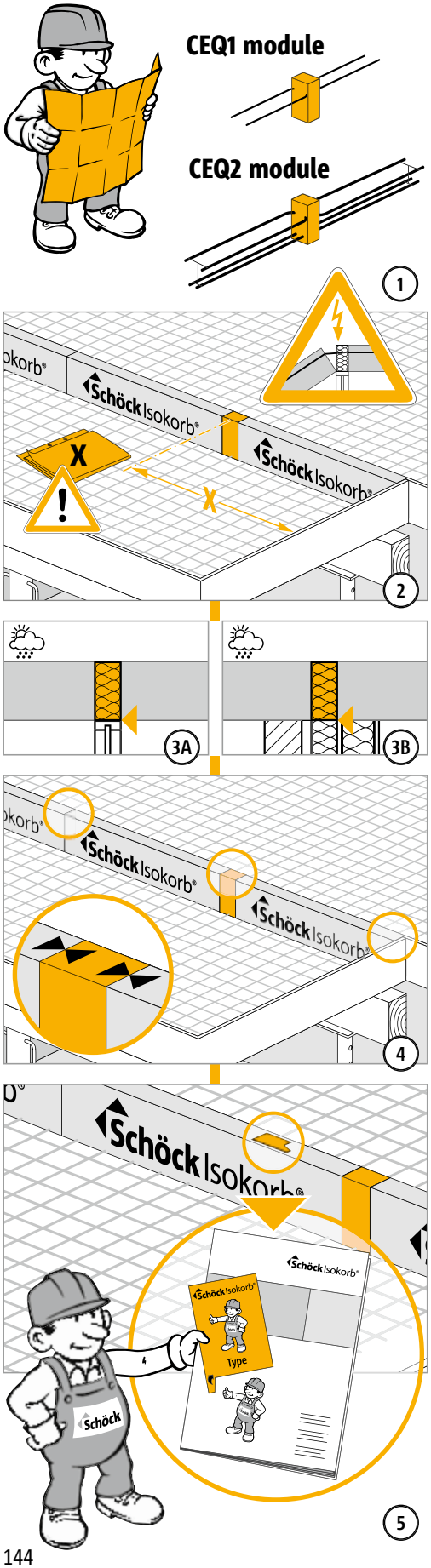


⑪ Install the upper slab reinforcement according to the reinforcement layout provided by the structural engineer.

⑫ Properly connect the upper slab reinforcement with the Schöck Isokorb® tension rods on site.
Maintain a ≤ 0,2 x l_s distance between the overlapping reinforcement and the Schöck Isokorb® tension rod.

⑬ Before placing the concrete, check the alignment and connecting reinforcement of Schöck Isokorb® as well as the concrete cover. To keep the Schöck Isokorb® component in place, ensure that the concrete is filled and compacted evenly on both sides.

Schöck Isokorb® Type CEQ
Installation guideline



① Check Schöck Isokorb® for damage and for consistency with design drawings.
Check to ensure that the materials required to install Schöck Isokorb® for the construction project are complete.

② Attention: The Schöck Isokorb® CEQ module must be arranged between the Schöck Isokorb® basic types according to the design drawings.

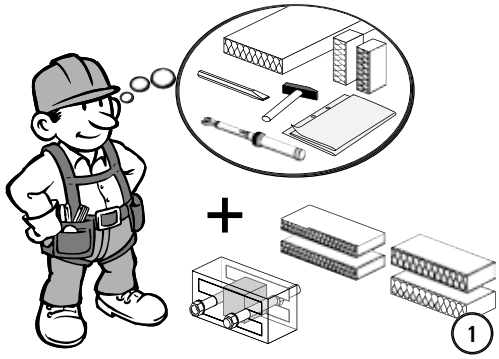
▸ WARNING: The CEQ modules alone cannot transfer vertical balcony loads. They must therefore always be combined with the basic Schöck Isokorb® types (CM, CV) according to the implementation plan. Otherwise the balcony will lead to the balcony slab breaking off. This situation could result in death or serious unjury.

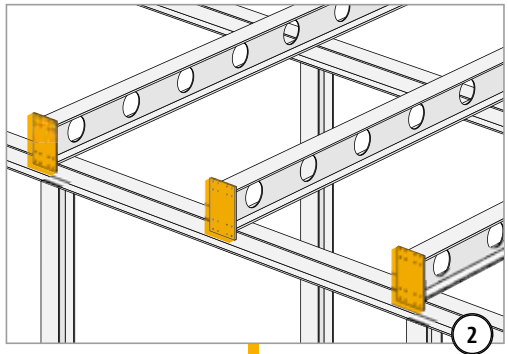
③ Ensure that Schöck Isokorb® is positioned according to the design drawings.

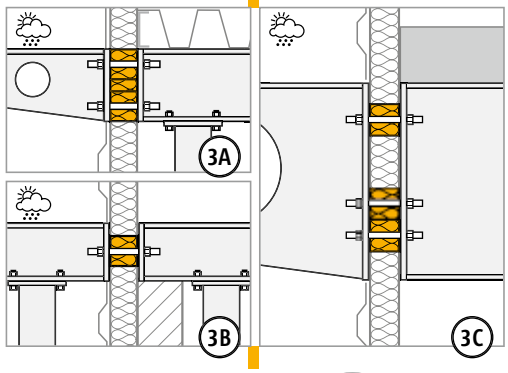
④ Joints between Schöck Isokorb® CEQ module and adjacent Schöck Isokorb® basic types or edge connections must be tight.

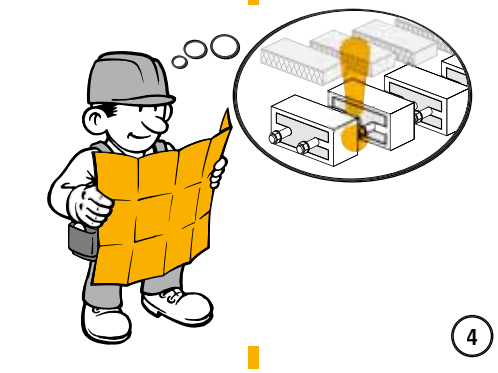
⑤ Installation of Schöck Isokorb® basic types next to Schöck Isokorb® CEQ modules as well as the installation of on-site reinforcement must follow the relevant installation guidelines for the basic Schöck Isokorb® types.

Schöck Isokorb® Type S22
Installation guideline









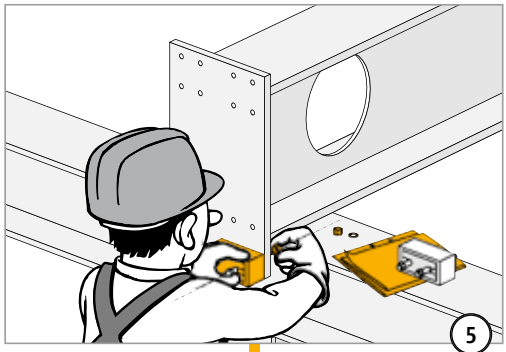
① + ②

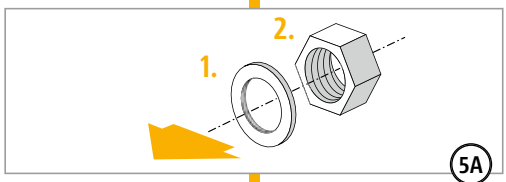
- Check Schöck Isokorb® for damage and for consistency with design drawings.
- Check to ensure that the materials required to install Schöck Isokorb® for the construction project are complete.
- Check to ensure that the personal protective equipment required to install Schöck Isokorb® in accordance with all legal provisions is complete.

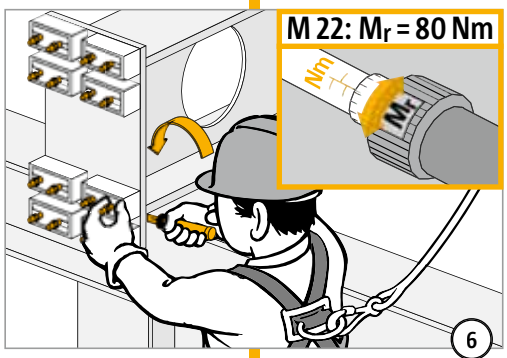
③ Ensure that Schöck Isokorb® is positioned according to the design drawings.

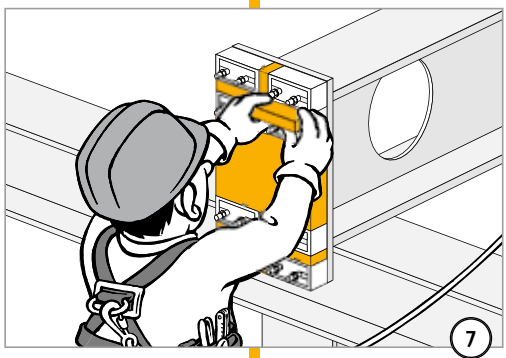
④ Check to see that all Schöck Isokorb® S22-types and thermal insulation pieces are complete based on the design drawings.

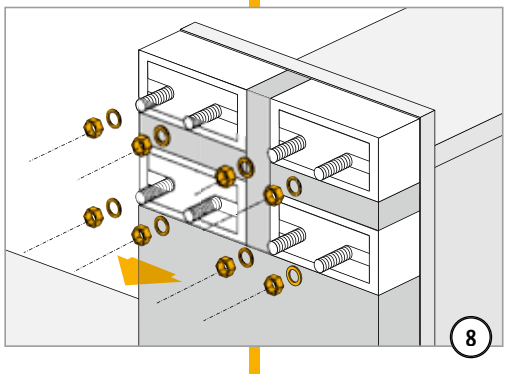
Schöck Isokorb® Type S22
Installation guideline











⑤ Install Schöck Isokorb® S22-types according to the design drawings on the head plate of the steel beam within the building shell.

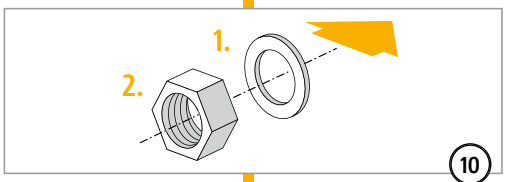
Image 5A: Fasten Schöck Isokorb® S22-tyes with the washers and nuts delivered along with the Isokorb® product in the order shown in the image.

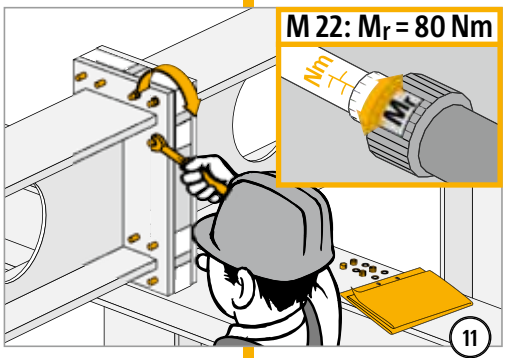
⑥ Use a torque wrench to tighten all nuts on the head plate without systematic prestressing according to the tightening torque predefined for the bolt.

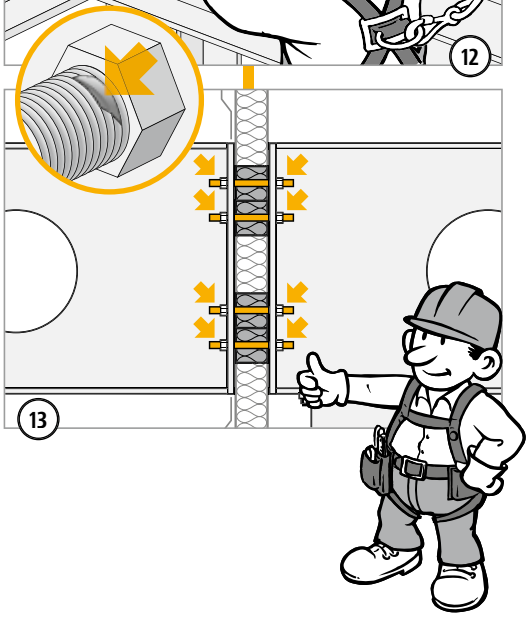
⑦ Fit any additional thermal insulation pieces at the head plate of the steel beam between the individual Schöck Isokorb® types.

⑧ Remove and retain all nuts and washers before connecting the exterior steel beam.

Schöck Isokorb® Type S22
Installation guideline







⑨ Guide the exterior steel beam with head plate towards the connection prepared with Schöck Isokorb® Type S22 and thermal insulation pieces. Position the exterior steel beam in a manner that prevents tension when the Schöck Isokorb® bolts are fitted.

⑩ Fasten steel beams on the Schöck Isokorb® S22-tyes with the washers and nuts delivered along with the Isokorb® product in the order shown in the image.

⑪ Use a torque wrench to tighten all nuts on the head plate without systematic prestressing according to the tightening torque predefined for the bolt.

⑫ + ⑬
Check the alignment and tight fit of the steel beams one last time and then deeply notch all bolts directly at the nut in order to ensure that all nuts remain in a frictional connection.

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Publisher: Schoeck Canada Inc.
202-279 King Street West
Kitchener, Ontario, N2G 1B1
Canada
Telephone: +1 519 896 2100
Cell phone: +1 416 890 8393
Fax: +1 519 896 2190
info@schoeck.ca
www.schoeck.ca

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202-279 King Street West
Kitchener, Ontario, N2G 1B1
Canada
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www.schoeck.ca

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